Halson

# A Course of Lectures on the Theory and Practice of Chemistry

by

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# Lecture 15th

The ⊕ is supposed to be diffused plentifully in the Air — This opinion is founded upon the following Facts. — If an Alkaline Salt is exposed to the air sometime we are told that a Vitriolic ♃, or Glauber salt will be formed from it, according to the Nature of the Alkali we employ. But we have some reason to doubt this Experiment — — —

— Vogel (an able Chemist as well as an elegant Writer upon the Materia Medica) tells us that he exposed salt of ♃ six months, & found no kind of change produced in it. But further; If the Air abounded so much with this ⊕ as some have supposed it would be collected & fall down in Rain or Snow. — But these, after having been subjected to ye most accurate Experiments by Mr. Margraaf of Berlin have never been found to yeild the least Particle of it. Mr. Shaw mentions another fact to proove that this Salt is ~~Sd~~ diffused thro' the Air in a Native State.



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He says that upon exposing a Piece of Iron for some Months to the Air, he found it converted into a green Vitriol. — A substance this which is composed of ⊕ & Iron. In answer to this I would observe, that other Acids produce a salt when mixed with Iron, which bear a very great resemblance to green Vitriol. The Air we must remember always abounds, more especially at certain Seasons of the Year, with Vegetable Effluvia, which are capable of fermentation. ~~a Vegetable~~ The moisture of the Atmosphere always favours this Fermentation. A Vegetable Acid or Vinegar is produced from those matters which are capable of corroding Iron as powerfully as ⊕. — The gradual Rusting of our Fire-shovels, & Tongs is occasioned by nothing else but the action of an acid produced in this manner upon them. By wrapping them in pieces of brown paper ~~we find~~ we find the effect of this floating Vegetable acid is prevented, & they continue bright & clear for many years.

(+32) But a 3d Argument in favour of the presence

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-sence of ⊕ in the Air, is brot from Electricity.—
The Other which occasions this, has been known to
change the Syrup of Violets to a red Color. —
—Besides this it has the smell & (according to some
who have received Electricity upon their Tongue)
it has the Taste of ⊕. But all this proves nothing.
we may answer it either by supposing with
Sr Isaac Newton, that the Other of Electricity,
(which is probably nothing but the pure uncom-
pounded △) is of an acid Nature, or that by pas-
sing thro ~~the~~ the Air, it contracts, & carries with
it, some of that Vegetable ⊖, which we before spoke
of in refuting Dr. Shaws Argument. — — —

But again — Some suppose, that the ⊕
abounds in a native state in the bowels of the
Earth, & that the subterraneous Vapor of Mines,
which proves so deleterious to Animals of all
kinds is occasioned by it. But we have no proofs
of this supposition & we shall hereafter show that
the deliterious effects of subterraneous Vapor depend upon

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upon a very different Cause. I conclude therefore that a simple state is not Natural to ⊕♄, & that it is never found except combined with Aërial substances. This leads us to another Part of the Natural History of ⊕♄ & i.e. to enquire with what substances it is most commonly combined. — — — — — —

— 1st Then the ⊕♄ we said had a strong attraction to △. Hence the Reason we so often find it in a state of ⚹ — This Substance consisting only of the pure △ & ⊕♄. — — — — — — — — —

— 2dly It has (we said) a strong attraction to alcaline Salts — & is sometimes found united to the fixed Alkali in a natural state — The Neutral Salt compounded from these two simple Salts is, as you will see in your Syllabus. — Glauber Salt. E:g: here is some — when it unites with the Vegetable Alkali, it forms a Vitriolated ♃. This is found in a native state in many Plants. It is likewise procured from the Ashes of Vegetables in making Pot ash. — — — — — — — — — —

(436) — — 3dly The ⊕♄ is often found united with Cal: Sal?

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Substances — In this state it is called Selinites. — It is sometimes found united with an Agillaceous Substances or Clay. — The Union of this with the ⊕ forms Alumn. Besides this we sometimes find it united with ye Earth we call Flate — In some cases it is combined with Stone — — 4ly It is found united by Nature with many of the Metals — when united with Iron it forms Green Vitriol — Salt of Steel or Copperas — with ♀ it forms blue or Roman Vitriol — as it is called — With Zink it forms white Vitriol These are ye 3 Metals with which it is most commonly combined by Nature or Art, If combined with any of the other Metals — It is called by the Names of those Metals — — — — — — — — —

— 5ly It is frequently found in mineral waters — This is ~~frequently~~ most probably occasioned by a Decomposition of Some of the other matters we spoke of, with which it is more commonly combined. But of this we shall say more when we come



to

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to treat of the Mineral Water. –

6ly & lastly so great is its attraction for Substances of all kinds, that we sometimes find it combined with wood itself. – – – – – – –

— Let us now inquire in what manner it becomes combined with so many different Substances. ♁ we know is diffused very where plentifully thro' the Bowels of ye Earth. By the Decomposition of this the ⊕ is seperated from it & afterwards unites with other Substances – This we see every Day in the Preparation of Alum & Vitriols of all kinds. –

Here then we may ask the Question, was all the ⊕ we are acquainted with originally in a State of ♁? – & has it undergone a Decomposition from Natural Causes such as Volcanos or subterraneous Fires, by which means its acid was detatched & afterwards combined in ye manner we see it.

Or 2ly As ye ⊕ has a strong Attraction to △ insomuch that it forsakes every other Substance to unite with it; may we not suppose that it was originally

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Originally combined with these Earthy & Metallic Substances, & that by coming in contact with ~~[illegible]~~ Matter abounding with Δ, it united with them, & so formed all the ♃ we find so plentifully diffused throughout all Nature? Each of these opinions might be supported with ~~[illegible]~~ several Arguments. — We are too little acquainted with the Nature of those Operations, which go forward in the bowels of the Earth to determine this Question. The former Opinion however appears to be the most probable. — — — — — — —

— The ⊕ is chiefly procured for the purposes of Art from ~~Calcolated~~ Vitriol — ♃ & Alum — The practice upon the latter is now much neglected — Vitriol & ♃ are now most generally employed. — of these two ♃ is to be preferred since 15 out of 16 parts of its weight are supposed to be pure ⊕. You will see particular directions for conducting these Processes in Macquair & Boerhaaves Chemistry — I would here observe that I shall seldom take up your time

or

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or trespass upon your Patience by delivering a minute Detail of all the Chemical Processes — you will find them discribed with sufficient accuracy by the aforesaid Authors, & by Dr. Lewis in his New Dispensatory — I shall beg leave however now & then to make an observation or two upon these Processes, when I have any thing new to say of them. —

1st With Regard to the Practice of getting ⊕ from Green Vitriol I shall observe that the calcining of it before it is subjected to Distillation, serves not only to dissipate a large Proportion of Water from the Vitriol, which might otherwise obstruct the Process. But also to prevent ye fusion of the Vitriol during distillation, which would infallibly brak our Vessels. Earthen Vessels are most proper for this purpose. The heat must be very gradual, 'till Watery Vapors arise. — After this we must keep it in an equall state for some time, 'till they rise lis copiously.

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The Heat must thus be ~~occasioned~~ encreased a second time till the Acid begins to rise - after this it should again be preserved equal, till white Clouds appear. - When these are removed we may raise the Heat to any Degree we please. - The stopping of the Distillation at a proper time can only be understood by those who are well acquainted with the appearances, which occur in this Process. -

2dly Altho ♃ contains so great a quantity of ☉, yet not more than 2 or 3 ℥ would be obtained from a pound of it, by any of the former processes. The Method practised most generally was to separate pur Campanam, but the Air in this Case soon became too hot to condense the Fumes which arose from ij ♃ below. -

Homberg improved this method a little, by inserting a long tube for admitting fresh Air into the Bell as it is called, But he found that it suffered to great a quantity of Fumes to escape thro' it. In short all attempts to procure ij ☉ in

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any large Quantities in this way were to no purpose untill Cornelius Drebel a Chemist in Holland invented a Method of obtaining it in large Vessels by the Addition of Nitre. This enabled ye ♃ to inflame without any immediate communication with the Air. The Quantity of Nitre used by Drebel is said to have been 6 ℔ to 100 ℔ of ♃ — — These Proportions are so unequal that their union was attended with no inconvenience. — Mr. Ward sometime after this, introduced a method into England, & obtained a patent for it, by which he procured a great Quantity of the ♃ from ♃ — This Method is now in the Hands of a few people in England & Scotland. — Various conjectures have been formed concerning the manner of conducting it. From ye uncommon size of the Vessels they employ, some have imagined it is only some trifling Improvement in the Method invented by Cornelius Drebel —

— Before I conclude our account of ♃, I would just observe that there is another species taken

Notice

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Notice of by Authors, called ye Vol: vit: Acid. This is nothing ~~but~~ else but common Oy combined with an extraordinary Quantity of ⊼ or some fine oily matter abounding with it. Its Properties are some-what different from those of the fixed Oy. In par-ticular it will not change the ~~spirits of Vitriol~~ Syrup of Violets to a red Color, nor will it make Ether when combined with ardent Spirits. In its Relation to most of the other objects of Chemistry, it agrees with the common Oy. — —

## — Of the Oy. — —

The Oy like ye Oy is never found ~~pure~~ in a simple uncompounded state. It is obtained for the purpo-ses of Art & Medicine, by means of a Chemical Ope-ration — When pure it is of a reddish Color, & emits strong ~~fumes~~ Fumes, which tinge the Air of ye same Color. These Fumes are very acrid, & give a sense of Pain when received into the Lungs. — — Let us attend to the effects of Mixture upon ye Oy — & here as in treating upon the Oy we shall

point

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point out its Relation to all the Objects in Chemistry. — — —

— 1st The ⊖ unites with all the other acids — with ⊖ it forms Aqua Regia, which is the only solvent for Gold we are acquainted with —

— 2dly It unites readily with all the Alkalies producing Effervescence & Heat. With the fossil Alkali it forms Cubic Nitre — with Vegetable Alcali it forms common Nitre & with ☿ it forms the Nitrous Ammoniac. — This you may see illustrated in the Table of Neutral Salts in the 10 page of the Syllabus. — — — —

— 3dly The ⊖ unites readily with most of the Earths particularly with the Calcaria & Clays. —

— 4thly It has a strong attraction to △ & unites eagerly to all Matters which contain it. If ℥ss of it with a few drops of ⊖ is added to the same Quantity of Turpentine, it will ~~cause~~ burn out in a Violent Flame. — This Experiment succeeds equally well with all the other Aromatic Oils —

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The ⊕ should always be as much concentrated as possible. — The most distinguishing property of this is its strong attraction to △. — — —

— 5ly It unites with all the Metals except ☉ — It corrodes Tin & ♁ — but does not suspend them in a fluid form — or in other Words does not form a compleat solution with them —

— 6ly It has a strong attraction to Water, insomuch that it attracts it from the Air. It unites with Water generating a good deal of Heat — Ebullition — & Fumes. — The Color of ⊕ is changed from a red to a green or blue by the addition of Water — This only takes place when the Acid is highly concentrated. It depends upon the presence of △ in the Acid — But of this we shall say more when we come to treat of Ardent Spirits. — —

— Like the ⊖, the ⊕ produces an entire Cold when it is ~~poured~~ poured upon Snow or Ice. —

— It dissolves Vegetable & Animal substances in the same manner as the ⊖ —

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Let us now attend to the Natural History & origine of ☉ — — — — — — —

— The ☉ is always found in a compound state united to a fixed — Vegetable or Volatile Alkali — in the form of Cubic or common Nitre — or Nitrous Ammoniac — We shall Delay speaking of the Natural History of these till we come to treat of the Neutral Salts — &c —

— In the Mean time we shall content ourselves in pointing out the Method of separating it from these Salts. — — — —

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There are three different Methods of separating ♁ from Nitre of each of which we shall speak in order.—

1st It may be separated from it by adding a Quantity of brick dust or Clay to the Nitre, & afterwards subjecting it to a Distillation — The Use of Brick-Dust or Clay, is to divide the Nitre in order to prevent its Fusion, & to favour its Resolution. — This is one of the Cases of addition in treating upon this subject. Some have supposed that the Clay or Brick dust, which are employed here, decompose the Nitre in consequence of their containing a portion of ♁ in them. But this we are sure is not the Case, for Mr. Pott of Berlin found the Distillation to succeed equally well when he employed a Clay which was entirely free from every kind of Saline Matter.— These Substances we conclude therefore act Mechanically alone in decomposing Nitre. This method of obtain-

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obtaining O> is now laid aside upon the account of the intense heat, ~~which is very~~ ~~Heat~~ which is necessary to detatch the acid salt — — — —

— a 2d. Method of obtaining ye O> is by adding a quantity of green Vitriol to the Nitre & distilling them together. The O> forsakes ye Iron with which it is combined, & unites with the Alcaline Basis of the Nitre, to which it has a greater Elective Attraction, as you will see in the first column of your Table in the Syllabus — In consequence of this what follows? — Does O> unite with ye ♂ ~~with~~ which the O> deserted, & thus form a double attraction? Was it not for the Heat of the Furnace this would certainly be the Case. — But ye O> is no sooner detatched from its Alkaline Basis by the O>, than it is drove over into the Receiver by means of the Heat in the Form of Fumes — It is a practice among some, to add Water to the green Vitriol, but this not only weakens the O> but helps to encrease its tendency to escape by Fumes. Instead of adding Water to it, it is much better

better to calcine ye Vitriol, before we put it into the Retort in order to dissipate every Drop of Water from it — This Method is only used in large works, when we want ~~the~~ to obtain ⊖ in a large quantity. —

— 3dly It may be procured with much less Heat & with less trouble when ye ⊖ alone is used to decompose the Nitre. The Nitre must first be reduced to a fine Powder — It is of use when we want a very concentrated ⊖, to calcine the Nitre in order to dissipate the ~~Nitre~~ water which it contain — To this Powder ye ⊖ should be added, but in what proportion is still a matter in dispute — The general Rule is to add one part of ⊖ to 2 of Nitre. Dr Lewis objects to this proportion & says that it leaves a residuum behind it which is insoluble in Water, & which upon this account cannot be easily cleanged from a retort — — The London College directs 3 parts of Nitre to one of ⊖. By this proportion we not only obtain a ⊖, but a Residuum from which we may make a Vitriolated ♃. When we do not want to preserve the Residuum, the first Proportion should be preferred. —

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poured — After the Oz is poured ~~out~~ upon the Nitre, it should be exposed gradually to the heat, till Red Vapors begin to rise. And ~~here~~ here several new difficulties occur — These Vapors are so penetrating that no Luting whatever will confine them — They sometimes break all our Vessels from their great Elastic Force, — & they are at all times so disagreable & dangerous to the Lungs that many people have spit Blood after being exposed to them —

— To obviate all these difficulties Mr. Wolfe has invented a method of confining these Elastic Vapors ~~in Vapors~~ in Water, so that they never ~~endange~~ in the least endanger the Vessel or the Operator —

— The Quantity collected in the Water is very small — so inconsiderable as not to generate the least heat when it mixes with the Water — You will conceive best of this method by the process which is now going forward before you —

— The Oz obtained in this manner generally contains a small Portion of Oz which rises in ij Oz in ij

Distillation

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Distillation. It likewise contains a ſmall quantity of ⊖>, which ariſes from the common ſalt, which is always preſent in ſome degree even in the pureſt Nitre, & which undergoes a decompoſition by Means of ⊕>. In which manner ſhall we ſeperate these two acids from ⦶>? — It is no difficult thing to answer this Question. The ⊕> may be ſeperated by means of Cohobation (ie) by distilling the ⦶> a ſecond time either upon ~~pass~~ the ſame, or a freſh quantity of Nitre which will attract ÿ ⊕> from ÿ ⦶> while the latter is ~~ſufficient~~ ſuffered to riſe again into a Receiver — — — — — — — — — — —

— The ⊖> is ſeperated from the ⦶> by a ſimple Elective attraction (ie) by adding to the Whole a Solution of ☽ in ÿ ⦶> — for the ⊖> attracts ☽ in its calcined, or diſsolved ſtate ſo ſtrongly that it chearfully forsakes the ⦶> for it, & leaves it in a pure & ſimple ſtate. The ⊕> as well as the ⊖> may be precipitated from the ⦶> by the addition of this ſolution of ☽ in aqua Fortis. They both fall together in the ~~Forms~~ Form of White Clouds. By this ſimple proceſs we may ſave ourſelves the trouble

of

trouble of subjecting the Or to the operation of Cohobation. —

## Of the Or —

— The Or is neither so volatile, nor yet so hurtful as the Or. It emits Fumes of a golden Color which smell like Saffron. Its specific Gravity when most concentrated is to Water as 12 to 10. — Heat serves only to dissipate its water from it. — — —

— 1st It mixes with the Or; and forms when combined with it Aqua Regia, it Derives this Name from its dissolving Gold which from its Purity & other Qualities has obtained ye Name of Rex Metallorum —

— 2ly It unites with all ye Alkalies producing Heat & Effervescence, with the fossil Alcali it forms common Salt with the ~~other~~ Vegetable Alcali it forms digestive Salt. & with the other Volatile Alkalies it forms Sal Ammoniacum. This you will see illustrated in the Table of Neutral Salts in the 10 page of your Syllabus — — — — — — — — —

— 3ly The Or unites with most of the Earths — with the Calcareous Earths it forms a neutral Salt

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which is known by the name of Sal Ammoniacum fixum —

— 4ly It has but a slender Attraction to inflammable Matter — It will not unite with oils. This is probably occasioned by the ☉ containing a quantity of Water in it, even in its most concentrated state — It unites with some difficulty with ardent spirits & produces from the Mixture a Neutral Æther —

— 5ly It unites with all the Metals except Gold. It will not dissolve ☿ nor ♂, in the Cold. — It only corrodes lead, ☽, & Bismuth. — — — — — —

— 6ly It has a considerable attraction for ♃ but when united with it does not produce so much heat as the ☉ or ☾. — — — — — — — —

— 7ly It dissolves Animal & Vegetable substances, but without giving them that black color — which the other two mineral Acids produce. — This depends upon its slender attraction for the ♃ — It is upon this account that it is so much employed by Anatomists in their preparations of injected Wax — for the acid dissolves the Flesh entirely, & leaves the Wax in the exact shape of the Part injected. It remains now,

that

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that we enquire into the Origin or Natural History of this mineral Acid. —

— It is never found in a simple state, but always combined either in common Salt, or Sal Ammoniac. In the former only it is said to exist in a native state — Its Production in the latter depends upon Inflammation, as we shall say when we come to treat of the Manufactory of Sal Ammoniac, so that this Salt may be called an Artificial Substance

— It is attained chiefly from common Salt, for no other Reason, than that it is less expensive than Sal Ammoniac, for the Acid is exactly the same in both — —

— There are ~~three~~ four methods of obtaining this 7 from Common Salt in Distillation. —

— 1.st We are directed by Some, to add Common Earth or Sand, in order to separate the Acid from its Alcaline Basis — Glauber describes this method of Distilling O7 very particularly & recommends it strongly. — He orders ij Salt first to be fused in a Crucible over the fire, in Order that all the Sordes or foreign matters may be washed from it — The earth which is used to detain ij O, should be made into

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little Balls, which should afterwards be burnt in the fire, & then dipped into salt while it remains in its fused or liquid State — They should ~~&~~ then be put both together into a Retort, & exposed to a strong heat; a little Water should be put into a Receiver in order to condense the Fumes — This Method of distilling the ☉ is very tedious, & yeilds but an inconsiderable quantity of the Acid — & this so impregnated with Phlegm, that it requires several Operations to separate it — After all, the ☉ often rises with the Phlegm or Water; upon the account of its great Volatility — Upon this account this Method of Distill~~ation~~ing the ☉ is now laid aside. — — —

When Sand is added instead of Clay, the alcaline Basis of the common salt unites with it, & Vitrifies it in such a manner as to form Glass — for Glass as we shall say hereafter is nothing else but an Alkaline salt combined with a Vitrified Earth — — The ☉ obtained in this manner is much purer than that obtained by means of Clay. —

2ly The ☉ may be procured from common salt, by

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by adding the Oy to it. This from its stronger elective Attraction to the Alcali of the salt, unites with it, & sets the Oy at liberty. The Neutral salt which remains is a Cubic Nitre. This as you will see in your Table is composed of Fixed Alcali & ij Oy. —

3ly The Oy is obtained by adding some of the compounds of Oy to it. The Combination of the Oy with the Metals particularly with green Vitriol, will not do here as in the former Case, upon the account of the tendency, which the Iron when the Oy forsakes it, has to unite with the Oy & to rise with it in the Receiver. The Flores Martialis which are obtained by distilling Vitriol & sal Ammoniac are a proof of the ~~strong~~ great attraction ~~the~~ Iron has to Oy, & the strong disposition they have to rise together. — Oy united to Clay in the Form of Alum may be used with advantage, in decomposing Common Salt. But there is no method of procuring the Oy equal to the

4th & last. which is by adding pure Oy to it — The same Proportions of each may be used here which we employed in distilling Oy; some of the Oy will arise with Oy, in spite of all we can do to prevent it.

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it. — But it may be separated afterwards by a very simple Operation (ie) by adding to the ⊖7 a little Calcareous Earth — The ⊖7 attracts this so powerfully that it immediately diverts the ⊖7 & fall to the bottom with it in ye form of Selenites. —
Water was formerly employed to confine the fumes of the Acid — for they are more Volatile & dangerous than the Fumes of the ⊖7. But Mr. Wolfs ingenious Contrivance renders the addition of Water unnecessary — so that we obtain as concentrated a ⊖7 as we please by the first Process — We may always know when the Distillation is advanced far, & by the appearance of deep ~~green~~ yellow Fumes, & a few air bubbles on the ~~top~~ surface of the Liquor in the Receiver. We shall show the process for obtaining this Acid in our next Lecture. —

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We come now to treat of the Vegtable Acids. —

They all possess several of the most distinguishing Properties of the Mineral Acids. — They impart a sower taste to the tongue — They strike a red Color when mixed with the Syrup of Violets, & they unite with alkaline Salts with some heat & Effervescence, & form Neutral Salts from their Combination with them — In their Relation to the other objects of Chemistry their effects are less remarkable — They possess however even in these Cases some of the Properties of ye mineral acids only in a much less degree. —

— They are divided into the Native, the fermented & the Distilled — of each of which we shall treat in order

## The Native Acid —

This acid contains a large quantity of gross mucilaginous Matter — By Heat it parts with some of this Matter, by which means it becomes more concentrated — The Heat used to evaporate the Phlegm, or Mucilage from it should be very gentle, or it will

be

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apt to contract an Empireuma. — Rob is obtained in this manner from the Juice of Lemons — In preparing this Liquor, we are directed to continue ye Evaporation till it acquires the Consistance of a Syrup — for Unless all the faculent or Mucilaginous Parts are dissipated from this, as well as the other native Acids, they soon undergo a putrefactive Fermentation — But before the Rob acquires the Consistance of a Syrup it generally contracts ~~the Consistance~~ an Empireumatic taste. — To obviate this we should evaporate less from it, & in order to prevent its becoming mouldy or putrid, add to it a little V which not only serves to check its Fermentation, but is likewise a useful addition to it in that Drink in which Rob is generally employed. —

— Let us next attend to ye Effects of Mixture upon this Acid —

— 1. It unites with all the Alkaline salts producing Heat & Effervescence. — It is from a Union of ye Juice of Lemons with the Vegetable Alkali that the saline Mixture is formed — A salt this, which is much



used

used in Medicine as a Diaphoretic, but which possesses that quality in so inconsiderable a Degree, that it is obliged to Custom alone for having a place in our Shops or Prescriptions —

— 2ly It has no attraction for ⅄ — But when it united with the Vegetable Alkali it is soluble in ⅴ —

— 3ly It unites with & dissolves the Absorbent Earths —

— 4ly It dissolves several Metallic Bodies, particularly Iron — Copper & Lead. — It is upon ye account of its attraction to Copper, that we are directed to be so very cautious in procuring the Juice of Summer Fruits in Copper Vessels — The Metallic Salt obtained from ye Combination of this Acid & Copper, being sometimes a sudden & at all times a slow Poison —

5ly It unites readily with Water — But

6ly Has no remarkable Action on Vegetable or Animal Substances. —

with

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With Regard to its Origin or Natural History — It is obtained plentifully from Limes — Lemons — Oranges & Citrons — It exists in most of our Summer Fruits, especially in the early stage of their Maturation. In proportion as they advance in their Degree of Maturation the acid becomes wrapped up in Sugar, but in such a manner that it is easily evolved by Fermentation, as we shall say presently in treating of the fermented ~~Liquors~~ Acids. There is no Vegetable substance, which yields this salt in a Crystalized Form except the common Wood sorrel, which is found in such large quantities in all Parts of this Country — ℔ss of the Leaves of fresh sorrel yielded ℔6 of Juice from which were obtained ℥ij-℥ij & ℈j of a solid crystalized acid Salt. —

— I need not say that the Method of Obtaining this Natural Acid from Vegetables is by simple Expression. We shall point out its uses when we come to treat of the Pharmacy of the acid Salts in general

Of

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## Of the fermented Acid. —

This acid procured by Fermentation is of two kind
Vinegar — & Tartar —

We shall 1st treat of Vinegar —
This Acid is always considerably diluted with water —
By heat part of this Water may be dissipated — It is
in this measure we are directed to concentrate this
Acid by Macquair: viz: by Distillation — But this
cannot be done to any degree without giving the
Vinegar such an Empireuma, as unfits for any
Oeconomical Uses. Besides there is so little between ye
Volatility of Water & this acid, that the latter often
Ascends with the former into a Reciver — A better
Method of concentrating this Acid is by exposing it
to a degree of Cold 12: below the freezing point in
Farenheits Thermometer — The Water by these means
is converted into Ice, while the strong parts of ye Vine-
gar remain in a fluid form — Dr. Cullen used to
inform his pupils, that he reduced 2 pints of Vinegar
to ½ a pint by exposing it one Night to the Cold. —
Some of you were witnesses last year of our reducing
(162) 2 pints of Vinegar to a spoonful or two, which was
so

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so highly concentrated as to impart nearly as pungent a Taste to the Tongue as ye Mineral acids —

## — Effects of Mixture —

1st The Vinegar unites readily with all the alkalis — With the Vegetable Alkali it forms Regenerated or ~~[illegible]~~ terra foliated ☿ or Sal Diuretic — With the Volatile Alkali it forms Spiritus Mindereri, This you will see in the table of Neutral Salts —

2d. It unites with & dissolves several of the Earths particularly the Calcareous

3d — It has little or no attraction to Inflammable Substances —

4th It dissolves several of the Metals — It unites with Copper former Verdigris — It produces the Medicinal Vertues from Iron — It dissolves the Antimony ♁ in their Calcined States — It is of importance to attend to this observation for we shall show hereafter when we come to treat of these two Semimetals — That their effects upon the human body will be greatly enflamed by the Presence or strength of this fermentated acid.

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fermented acid in ye Stomach — It unites likewise with Zinc & Lead, with the latter it forms Saccharum Saturni. It may be seperated from either of these Metals either by means of Heat, or any Elective attraction — It is apt to contract some of ye delitirious qualities of Zink & Copper when it is seperated from them. — But it may be entirely seperated from the Lead — — This Method of Combining Vinegar with lead, & afterwards seperating ~~the Vinegar~~ it is sometimes employed in concentrating the Vinegar — A most Concentrated acid is obtained in this manner, equal in strength & Volatility to ye mineral Acids — Dr. Black obtained a Vegetable Acid, so strong, by these means that it appeared in a solid Crystalized Form. It is however seldom necessary to prepare it in this Manner — When it is distilled or concentrated by Frost it answers all the Purposes we would wish for. — Besides the acid obtained from Lead is seldom pure — It brings over with it so much of ye Δ from ye Lead, that it has as many of the Properties of acid Spirits as it has of Vinegar. —

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4ly It has but a small attraction for Water, & makes but a slight Impression upon Animal Substances, where it is in its most concentrated state — It contracts ye Virtues of Several Parts of Plants as we shall say hereafter. —

— We shall consider the Natural History of Vinegar. When we come to deliver the Chemical History of Vegetables — In general we may observe that it is produced by Fermentation from Sweet Vegetable Juices — Whether the Acid is only evolved, or originally formed by Fermentation, we cannot pretend to determine. It is probable it exists materially in the Vegetable Juices, but that it is so wrapped up in Sugar or Mucilage that it is not obvious to our Senses.

## — Of Tartar —

This Acid has been supposed by some Chemists to be the same as Vinegar, but it differs from it in not being soluble in ℣ when combined with an Alcaline Salt — & in not forming a Sacharine Concrete when united with Lead — It is moreover seperated from its compound ~~with~~ Alkaline Salts — & the Absorbent Earth by means of the Acetous Acid. It is always procured

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procured in a solid Form. It contains a considerable quantity of an Oily Inflammable Matter, which sometimes so involves its Acid, that it will not strike a red Color, when mixed with the Syrup of Violets. By means of Heat, this oily matter may be dissipated. When it is distilled in a Close Vessel a Caput Mortuum or Residuum is obtained, which yeilds a large Quantity of a pure Vegetable Alkali ℔j of ♃ subjected to this Distillation yeilded ℥iv of an Alcaline Salt — This is the only Salt, which can be produced in any quantity from Vegetables without burning them to Ashes in the open Air. —

## — Effects of Mixture —

1st It unites with all ye Alkaline Salts with heat & effervescence — It forms when combined with the fossil Alkali the Sal Rupellens called also — Sal Seignet — with the Vegetable Alkali it forms Soluble ♃ called also Tartar Tartarizatus — This you will see illustrated in your Table of Neutral Salt. —

2dly It unites readily with calcareous Earths forming therewith

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therewith a Compound which is soluble in water —

3ly It has but a slender attraction to inflammatory Substances. —

4th It dissolves several of ye Metallic Substances particularly Copper — Lead & Iron. —

5ly It attracts water but slightly — It requires 24 times its weight of Water to dissolve it. It is somewhat remarkable that its solubility in water is greatly encreased by its being combined with Alcaline Salts, Earths — & even Metallic Bodies themselves.

6ly Its Action upon Animal & Vegetable Substances is no ways remarkable —

It remains now that we take Notice of ye Origin of It — It is the Product entirely of Fermentation — It is obtained from Wines which deposits it in the Form of a Crust upon ye Bottom & Sides of Casks. — hence it is called by some Wine Stone Renish Wine affords it in the largest Quantities. The Wine is much improved in its Qualities by Decomposing this Salt — After this it becomes that celebrated Wine we call Old Hock. The

Tartar

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Tartar is of a white — yellow or red color, according to the Color of the Wine, from which it is obtained — The Rich, sweet Wines afford least of it — The older Wines are, the purer ♃ they deposit — The Whiteness of ♃ is always a mark of its Purity. It may be obtained when we want to procure a large Quantity of it at once, by evaporating the Lees of wine — ♃ is never used for the purposes of Medicine in this crude state — The method of purifying it formerly, was to boil it in Water, & afterwards skim it from the surface. — hence it obtained the name of Cream of Tartar. — The present Method of purifying it, is first to dissolve it in Water & then to suffer it to Crystallize — You will see a particular Account of this Process in Macquairs Chemistry — It is purified & crystallized in this manner in large Quantities at Montpelier in France — at Tripoli — at Venice — & in Several parts of Germany

## Of the Distilled Acid. —



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This Acid has been wrought upon so little by y Chemists that we have few Compounds formed from it. — It is very weak, & therefore contains the Properties of the Vegetable Acids in a lesser Degree, than those we have mentioned. It differs from them all in existing formally in Vegetable Substances, but so closely is united with them, that it cannot be obtained without Distillation — The others we said was procured by infusion & Fermentation — ~~It is obtained from Amber~~

As to its Natural History It is obtained from Amber, it abounds likewise in all the Species of the Fir Trees. If the Chips of this Wood are put into a Retort, & a gentle heat applied, we shall 1st obtain some Water, then an Acid — after this an Essential Oil, & lastly an Empireumatic Oil resembling Tar. They may each of them be obtained seperately by changing the Receiver — or a Bottle luted to the Receiver — The Acid should be concentrated by a second Distillation.

Lit: ry

It is this Acid which we taste in Tar-Water, & on which most of the Medicinal Virtues of ye Tar-Water depends — The more impure the Tar, or the less it is dephlegmated, the better it is calculated for making Tar Water — for the more of the distilled acid it retains — Upon this Account it is more remarked in England, that the Tar which comes from Norway is much better than that which is imported from America — The former is generally very impure — ye latter viz: that which comes from America, is rendered as free as possible from water & Impurities of all kinds, before it is exported as it is this alone which entitles it to the Bounty of the Government. —

— There is a Process for obtaining the Tar itself. — It rises with the essential Oil in making of Pitch but is seldom saved by the Workmen who manufacture this Article. I cannot help thinking but it might be applied to some very valuable Purposes in Medicine. —

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## Of the Animal Acids

It was long a matter of Dispute among the Chemists, whether any of the simple Salts were formed by Nature, or whether they were performed by the Operations of ~~Art~~ Chemistry – such as the united effects of heat & Mixture. We have seen an acid existing formerly in Certain Fruits – & in other Vegetable Substances – we have seen an Alcali existing formerly in ~~tt~~ – altho' it is so enveloped in an Acid, that none of its properties show themselves till the Acid is first drove from it in Distillation – We shall hereafter Mention other Proofs of the formal Existance of an Alkali in Vegetable Substances – ~~We shall hereafter mention other Proofs of~~

We come now to treat of Animal Acids; & here we shall find as in other Cases ye most convincing Proofs of their simple Salt being the Product of Nature. –

### 1st – Of the Acid of Ants –

These Industrious little Animals which have afforded so much Instruction to the Philosopher & ye Naturalist, afford likewise some knowledge

to

to the Chemist. — The Acid which is procured from these little Insects has many of the properties of Vinegar, but differs from it in some respects, as we shall see in treating of the Effects of Heat & Mixture — — By heat it is concentrated & if the heat is urged pretty strongly like the Vegetable Acid it contracts an Empyreumatic Taste. —

— Effects of Mixture —

1st It unites with the Vegetable Alkali & forms a Neutral Salt therefrom with oblong Crystals which Deliquate in the Air — It unites with the Volatile Alkali & forms a Neutral Liquor which like the Spiritus Mindererii yields no concrete Salt in Distillation.

2dly It dissolves all the Calcareous Earths such as Coral — Chalk — & Quicklime & forms with them a Crystalized Saline Substance which does not deliquate in the Air. —

3dly It has no remarkable Action upon Inflammables

4thly It dissolves the Calces of several of the Metals particularly of ☽ & ♀. If the former i.e. if ☽ is precipitated

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precipitated from Aqua fortis by the Salt of ♃, it unites intimately with it. If Copper is Calcined by means of Heat it dissolves it entirely. The Solution yeilds beautiful green Crystals – In this you see it differs from Vinegar which dissolves Copper in its Metallic State – It dissolves Iron filings with Violence, but it has little or no action upon the Calcs of this Metal – nor has it any attraction to the Calcs of Tin – It does not dissolve Lead in its Metallic state – but unites with it by the Assistance of Heat when it is calcined into what is called Minium or Red-Lead. —— A Solution of this Metallic Calx in this Acid when Evaporated shoots into a Saccharum Saturni. It differs from ye Saccharum Saturni obtained from Vinegar in parting with its Acid by Distillation without any change being wrought upon it – Vinegar we said when seperated from Lead brings over so much of △ that it resembles acid spirit more than a concentrated Acid –

It dissolves Zinc with Violence, & forms Crystals when it is evaporated which resemble the Crystals

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tals produced from a solution of ~~Lime~~ Zinc & Vinegar —
— It has no effect upon ♁ nor Bismuth either in
their Calcined or Metallic States. —
5ly It unites readily with Water, but has no ~~ordi-~~
~~nable~~ remarkable effect upon Animal, or Vegetable
Substances. —
— As to the Origin of this Acid, it is found de-
posited in little Cells or bags in the Ants — It is pro-
bably a peculiar Liquor & serves some Valuable Pur-
pose in the Animal Oeconomy, of those Animals,
with which we are not acquainted — It is of a Volatile
Nature — This we may easily perceive by stirring
an Ant Hill in the Spring or Summer — The
Smell has been Mistook for some, for that of
Spirits of Harts Horn or Sal Ammoniac, but
Closer Examination has convinced us that it arises
externally from an Acid Salt.
— In Order to Obtain the Acid we must put
a number of the Ants into a Retort with some
Water & subject them to a gentle Distillation —
— The Acid Rises with an essential Oil, which may
be afterwards separated from them. The Acids may be
concentrated by a second Distillation, or by ye means we
spoke off in treating upon Vinegar. Lect.

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# Lecture 18th April 1771.

## Of the Acid of Bees.

This acid like that of Ants, is a secreted Liquor & is obtained by distilling the Bees in Water. I have never yet heard the effects of heat upon it, or of its relation to the other Objects of Chemistry — An Acid of the same kind is obtained from Wasps — Hornets & several other Insects. — The Pain which these Animal occasion when they sting us has been by some attributed to their emitting a quantity of this Acid into the Wound they make — But how comes it that this Acid should produce so much more pain in the Flesh than any other of the Vegetable Acids. Vinegar we find is often poured into wounds in order to cleanse them, or to stop their Bleeding, & yet we find it seldom produces any thing but a transitory Pain. — Besides how comes it that Bees are never able to sting ~~more than once~~ but once? Why do they become Drones after it? It is because as Virgil expresses it "Animas in Vulnera ponunt"

If the Pain they gave was occasioned by an Emission of this acid ~~liquor~~ Liquor they would ~~it~~ have it in their Power to sting a second time after this liquor was received. — Any Person who has seen the rough & cragged appearance, which it sting of a Bee or Wasp makes in a Microscope, will require nothing else to account for the Pain they give us in stinging

## Of the Acid of Phosphorus.

This acid is a ~~mixture~~ native substance. It is however seldom obtained in a simple state without the assistance of Art. — It is mostly in a solid form, & is procured by decomposing a Neutral Salt, found in the Urine of all Animals Bodies, which resembles in many of its Properties the common Ammoniacal Salt. —

— The effects of Heat upon it are not very remarkable. If it is urged with an intense heat it bubbles & froths a good deal, & at last forms a kind of solid Glass. All this happens to it without any diminution of its Weight. —

Effects

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## Effects of Mixture —

1st It unites with the Vegetable Alkalies & affords a kind of oblong Crystals — It is naturally united with the Volatile Alcali, but this adheres so slightly to it that it may be easily dissipated from it with a very gentle Heat. In this Respect it differs from the common Sal amoniac which rises entirely into a Receiver before it suffers a Decomposition — So strongly does it attract ye fixed Alkalies that we have an Instance of its decomposing Common Salt — Nitre — & even Vitriolated Tart in order to unite with their respective Alkalies. —

2dly It unites with most of the Earths, but in order to do this, the Acid Glassy Salt & ye Earthy matters should be fused together in a Crucible. In this manner it unites intimately with Chalk — marble & Gypsum — It changes the Nature of even the Fixed Earths themselves so much that they afterwards imbibe moisture from the Air — The other Compounds of Earths & this acid are no ways deliquescent

3dly It has a strong Attraction to all Inflammable Substances

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Substances & unites eagerly to Coal, Soot & the like, when they are diluted together – It is from the union of this Acid, & the Δ, that Phosphorus is formed, as we shall say hereafter. Notwithstanding its strong attraction to Δ it parts with it readily as soon as it is exposed to the Air. It is the gradual ~~Esp~~ Escape of this Δ from the Acid, which forms the Light, & heat which we observe in burning Phosphorus

4ly It unites when dissolved in twice or thrice its weight of Water with Zink, & dissolves it entirely. – It likewise dissolves ♂ & Cobalt – It corrodes Copper slightly. To the Calces of Metals it has a stronger attraction in so much that it precipitates Regulus from its Solution in ☉7 – as also ☽ ♂ – ♀ – Lead ☿ & Bismuth from their Solutions in ☉7 & afterwards dissolves them. It even precipitates tin from Aqua Regia & dissolves it ~~entirely~~. intimately. – If a quantity of this Salt in its Dry form, be fused in a crucible in the manner we spoke of with the Earths, there is not one of them which cannot be acted upon by it. Even Gold itself by this method is sensibly diminished in its ~~weight~~ weight

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weight by a Portion of it dissolving in the Acid —

5ly This Acid dissolves in Water forming ~~with~~ with it a clear transparent Liquor somewhat resembling concentrated ⊕ — Its effects upon Animal & Vegetable Substances are no ways remarkable

It now remains that we say a few Words of ye Origin of this Acid of Urine —

— It is obtained entirely from ye Urine of Animals — It exists either formally in the Vegetables upon which Animals feed, or it is formed by the acetous fermentation which all Vegetable Substances undergo in the Stomachs of Animals — It ~~remain~~ continues unchanged by all the Powers of ye System Such as Digestion — ~~Chylification~~ Chylification — & Sanguification, but it does not continue in this simple uncompounded State. The Fluids & Solids of the Body are always in a State of Resolution — I call it Resolution to distinguish it from Putrefaction, which can never take place in ye full import of that Term in a living Body. All Animal Substances

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stances when they putrefy, evolve a Volatile Alcali.

The fluids & Solids of the human Body in their Tendency towards putrefaction evolve this Volatile Alkali — But happy for the Constitution it is no sooner evolved, than it mixes with the Animal acid which was materially present in the Blood & Juices, & forms with it that Neutral or Ammoniacal kind of Salt which is peculiar to animal bodies. It is formed in the greatest Quantity in the Urine, this being the common Vehicle to convey all foreline impurities from the Blood. It is formed in the largest Quantities in those Animals which feed upon Vegetables. It is never decomposed in the Body, altho its Alkali may be separated as we said before by a very gentle Heat out of the body. 20. Gallons of Urine after being putrefied — evaporated & Crystalized affords only ℥ii of this Salt. From this you may understand something concerning y Cause & cure of the Scurvy. In all the Histories we have of this Disease particularly in that most accurate Account we have of it in Lord Ansons Voyage

round

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round the World, you will find that Salt Provisions joined with an Obstruction of the Excretions, particularly of the Perspiration where the most invariable remote causes of the Scurvy — This was the Case in a more especial manner with them when they doubled Cape Horn, where the Hardships they endured from ~~that~~ wet Weather, salt Victuals & sickness were so great, as almost to exceed our belief of them. In what manner do these remote Causes act? In answer to this, I would observe, that the Salt conveid into the body by provisions, & the saline matter retained by the obstructed Perspiration, evolve this Volatile Alkali, & it is the Predominance of this Volatile Alkali in the blood, which constitutes ye proximate Cause of the Scurvy — You must not be surprized when you hear of the fixed Alkali of ye common Salt, which is used as a Condiment being changed into a Volatile alkali, ~~& it~~ We shall hereafter point out Instances of common Salt being changed into Nitre, & of several other Transmutations of Salt, still more extraordinary

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extraordinary. This Volatile Alkali altho' evolved from the common Salt & from the Animal Juices is far However from possessing the Distinguishing properties of the common Volatile Salts while it is in the Body — No proofs have ever been produced of the formal existance of it in the Blood, & even the Urine itself which is the ~~Cause which~~ Sink of all the Saline Matters in the Blood, will not evolve it so as to afford any of the Marks, we shall hereafter ~~treat of~~ Deliver of Alkaline Salts, till it has undergone a thorough putrefaction — This Volatile Alcali is however Materially present in the blood, but it is so fettered with Gross matters of an oily & earthy Nature that it cannot Show itself, or exert any of its Qualities. Let us now enquire into the Method of curing the Scurvy. This is very simple — It consists in nothing else but giving acids — Vegetables & all such substances as are capable of undergoing an Acetous Fermentation in the Stomach in

large

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large Quantities - These evolve an acid, which can not be altogether changed by the Powers of ye System, altho' it is so much altered as to possess several new properties, which do not belong to the Vegetable acids in general. This Acid by uniting with the Volatile Alkali which it finds in the body forms that Neutral Ammoniacal Salt from which we obtain ye Acid of Phosphorus, & thus cures the Scurvy - There is but one acid Salt remaining to be treated off which does not come properly under the head of Mineral - Vegetable or Animal Salts - It is

## Sedative Salt.

This Salt is brought to us only in a solid Crystalized form. Its Crystals contain a good deal of Water in them — They resemble fresh, or bruised Spermaceti in their appearance. They feels very much like ye latter, when they are rubbed between ye Fingers, Its Taste is somewhat bitter as well as sour.

### Effects of Heat.

Heat raises some Water from this Salt, joined with a little Saline Matter - From this Circumstance some

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Some have been led to conclude that it was of a Volatile Nature — But the sublimming of the saline matter depends entirely upon the ~~Quantity~~ Volatility of the Water, which carries up the salt with it — for if the Water is dissipated from y Crystals before they are put into a retort no saline matter will rise in the Receiver — After the Water rises from them, they run into a solid Mass which no heat whatever can drive over into a Receiver. If this solid Mass is dissolved in Water — new Crystals of Sedative salt may be Obtained from it —

Effects of Mixture

1st It unites with the Alkaline Salts & forms with them Salts which are capable of being Crystalized — So strongly does it attract these Salts, that it will decompose all the Neutral Salts except those composed of ⊕ in order to unite with them — Borax is composed of this salt & the fossil Alkali as you may see in your Table of Neutral Salts. Notwithstanding it dislodges the ⊕ & ⊖ it may be separated from its Alkaline Basis by either of them —

2dly It unites readily with the Calcareous & Argillaceous Earths.

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Earths —

3ly It attracts Inflammable very feebly. If a little of this Acid Salt is added to ℣ it causes the Spirit to burn with a beautiful blue Flame —

4ly It acts but feebly on the Metals —

5ly It dissolves in warm Water only, as soon as the Water ~~Crystalizes~~ cools it again Crystalizes —

6ly We have no account of its action upon Animal or Vegitable Substances —

— All we shall say at present concerning the Natural History of this Salt is that it is obtained from Borax, by Distilling it with either of the Mineral acids — About ½ of the Borax rises in the Receiver. The Resi: duum is a neutral Salt composed of the fossil Alkali (which was the Basis of the ~~Alkali~~ Borax) & of the Mineral acid employed in decomposing it — with this we finish our Chemical History of the Acid Salts —

But before we conclude we must take Notice of an Opinion which has prevailed among many Chemists, particularly

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⊕7 Vitriolic Acid

♃ Tartarum

△ Fire

7 Acid

♃ Sulpher

♀ Copper

△ Air.

⊕7 Nitrous Acid

⊖> Marine Acid

♅ Volatile Alkali

☉ Gold

♂ Iron

☽ Silver

☿ Quicksilver

▽ Water. (?)

∝ Alkali

⁜ Acetous Acid

particularly the followers of Dr. Stahl in Germany concerning the Nature of these Acids — When we take a Review of what We have said of them, we find they are very much alike in all their Properties — They all effervesce with Alkalies & chang the Syrup of Violets to a Red Color. — They all unite with Alkalies forming Neutral Salts; & most of them combine with Earthy, Metallic & Inflammable Substances. From this resemblance in the General properties of the Acids, some have supposed that there was a primogenial acid in Nature, & that the different species of them we have examined are nothing more than Modifications of this Acid with foreign Substances. We have never been able to discover the Substances which compose the different Acids — We can only ~~[illegible]~~ determine with Certainty that they contain Water, Air & perhaps a Δ. Some Chemists have thought that ⊕ is the only Primogenial Acid in Nature. But this opinion we cannot support till we are able to analyze it into different Parts. Mr. Homberg goes so far as to describe

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the Bodies which he supposes combine with a primitive or primogenial Acid forming the ⊕, the ◐, the ⊖ & the ✢ — He says there are three species of ♁ viz: Bituminous — Metallic & Vegetable — That a primogenial Acid united with the first of these forms ⊕ ↗, with the 2d ⊖ ↗, & with the third the ◐ ↗ & ✢ — This Opinion is far from being Chemical — For the ⊕ ↗ we find in our Experiments has the strongest attraction to bituminous Substances. The ⊖ ↗ to Metallic & the ◐ ↗ & ✢ to Vegitable substances. When we examine the Analogy of the other Productions of Nature, we find great Reason to admit this Opinion — Thus we find Water frequently united with Saline — Earthy — Metallic & Inflammable ~~Bodies~~ & Vegetable Substances, & yet water we are sure from many Experiments is a simple Body, & all the different kinds may be separated so far from the Matters which are mixed with it, as be ultimately the same — The Acids differ from it, only in being more intimately mixed with the Matters they dissolve in, so much that it is impossible to separate them. But that proves this Opinion

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nion beyond a Doubt, is that this different acid may be changed into each other — This common Salt may be changed into Nitre. Wallerius, Professor of Chemistry at Upsal, tells us that he formed a true ♎ by combining a ☉ with the Oil of Turpentine — this is a plain Demonstration of the ☉ being changed into the ⊕. Upon the Whole I cannot help embracing this Opinion of Dr. Stahl &. am fully convinced that there is but one primogenial Acid in Nature, all the different ~~species~~ species of them are nothing but modifications of this primogenial Acid with some adventitious Substances. —

— Before we dismiss the Acids I shall subjoin a few remarks upon their Pharmacy, or upon those preparations of them which are used in Medicine — We shall 1st. point out the general effects of the acids upon the human Body & then make an Observation or two upon each particular Acid. This will naturally lead us to those Preparations of the Acids which

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which are taken from the Dispensatories, which you will see set down in the 9th Page of your Syllabus

1st The acids have been supposed to be powerfully astringents in Hæmorrhages. Here they have been supposed to act by coagulating the Blood, & thus preventing its issuing forth from the particular Orifices of the Bleeding Vessels. Dr. Boerhaave & his Commentator Vanswieten, are full of this doctrine in their Treatment of putrid fevers. It may appear bold to say in opposition of two such great Authorities, that I do not believe they ever reach the Blood in their simple state, nor do they produce any distinct operation upon it. for supposing they escaped unchanged from the Stomach (as they cannot probably do) yet by mixing with the Bile, they are immediately covered in such a manner, that they are deprived of all their Acidity. In what manner Bile thus Neutralizes Acids, we shall say more fully hereafter when we come to deliver the Chemical History of the Fluids employed in Digestion

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The Green Color, which we so often observe in the Matter discharged both upwards & downwards in bilious Complaints is formed by nothing else but the Union of Bile with acids. But supposing they escaped unchanged by the Bile, it is highly probable that the Lacteals, whose sensibility is so very great would not admit them. — But supposing they were admitted into the Blood what would be the Consequence of it? A Coagulation of that Fluid would ensue of Course — then in what manner would it pass thro' the almost infinitely ~~ramified~~ minute Branches of the Pulmonary & Carotid Arteries, the constant Action of the ~~Pulmonary~~ Blood Vessels are absolutely necessary to preserve Life — Obstructions in either of these would soon bring on the most fatal Consequences. I conclude therefore that acids do not stop Haemorhages by entering or mixing with the Blood. Their Action is confined in these Cases only to the Stomach where they operate as Sedatives. By sedatives you no doubt know that we mean that Class of Medicines which allay

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the Motion of the Animal Spirits & thus diminish
ⁿ Impetus & action of the Heart & Arteries —
2ly all that we have said of the Acids not entering
the Blood as Astringents, applies with equal force
against their acting directly on the Blood as An=
tiseptics. This Opinion took its Rise from a Supposi=
=tion that in putrid fevers a Volatile Alkali was
always evolved from the Blood. — Acids were suppo=
=sed to act by mixing with & neutralizing this Alka=
=li & thus destroyed its malignant Effects upon the
Body — But we have direct Experiments which
prove, that no such Volatile Alkali is evolved in pu=
=trid fevers, even in their most malignant state — &
as we are sure, that Acid produce their Salutary
effects in these Cases, long ~~after~~ before they have time
to reach the Blood — much more to mix with &
neutralize a Volatile Alkali in it. But the Acids
may be so far sheathed or sattered with other mat=
=ters as to mix with the Blood, no one will deny —
we granted this in explaining the Action of ~~Ve~~=
Vegetables

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Vegetables in curing the Scurvy. — But then we deny that they ever enter it, or exist in it in a formal state — & we are sure that their effects in Hemorrhages, as well as in Fevers, are too sudden to be produced by their entering or mixing with the Blood in any Way. — Acids therefore act as ~~Antiseptics~~ Antiseptics only in a secondary manner. Their ~~effects~~ operation is confined entirely to the Stomach. By Restoring ye Tension of this Viscus which may be called with propriety the Index of ye Whole System they remove the Atonia of whole System, & thus obviate those Changes upon the Blood, which have been brot on by nothing, but mere debility. The Consistence of the Blood is always in Proportion to the Tone of the Vessels which act upon it. Hence you see the Absurdity of ye Terms Inflammatory Diathesis of the Blood. The Blood is entirely passive in most Diseases — Inflammatory Diathesis belongs only to the Solids —

— I shall now make a few Remarks upon the



different.

different species of the Acids as they are set down in the Dispensatory —

— Of the mineral acids, the ⊖ is chiefly used in Medicine. All the Preparations of them contain the same Virtues only in a greater or less degree — the ⊕ & ⊖ are seldom employed upon the account of their great Volatility, being apt to irritate the Lungs, & to cause a troublesome Cough — The ⊖ is less irritating than the ⊕. Glauber ~~chiefly~~ strongly recommends a small Quantity of it to be ~~drank~~ mixed with the Water drank at sea, in order to preserve its sweetness & to prevent the Scurvy. —

The Vegetable Acids are much used in Medicine — The Native Acid has been lately used with success in the Phthisis Pulmonalis. It should be taken in large quantities. The Sal Succini possesses but few of the Virtues of the Native Acids —

— The distilled Acids have been but little ~~been~~ employed in Medicine. I cannot help thinking considering ye Virtues of Tar Water — Tar Pills — & Pine'

Bud

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Bud-Tea, but that the Acid distilled from Prime Chips would contain great Medical Virtues. The Virtues of the said Medicines depend entirely upon the Acid they contain. The Oil which is mixed with this Acid oftener deminishes than adds to their Virtues —

— The Animal Acids have never been employed in Medicine —

— The Sedative Salt has been much celebrated by Homberg & others for great Sedative Virtues in Delirium — Fevers & the like — It is now laid aside & I believe not without sufficient proof of its being a useless Medicine. —



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# Lecture 19th April 6th 1771.

Having finished the Chemical History of the acid Salts we come no. treat of the Alkaline Salts. —

1st These simple Salts are known by the following Characters. — —

— 1st They impart a strong pungent Taste to the Tongue, which has been called by some a Urinous Taste — —

— 2dly they change ye Syrup of Violets to a green Color —

3dly They are remarkably detergent, in cleansing, & destroying the Sordes from Animal & Vegetable Substances — —

— 4thly They effervesce with Acids, this however is far from being a fixed Character of an Alkaline Salt. for there is a certain state of these Salts in which they will not effervesce with Acids — We shall say hereafter that this state is when they are deprived of their fixed Air — — —

— 5thly They are known from ye Combinations they form

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with Acids, Earths, Inflammable Bodies & Metallic Substances — of which we shall say more hereafter. The Alkalies are divided into 3 species viz: the fossil the Vegetable & ye Volatile —

## 1st of the Fossil Alkali. —

The effects of Heat upon this Salt, are to cause it to emit a considerable Vapor, which soon concretes again, upon being exposed to the Cold. —

## Effects of Mixture

1st The fossil Alkalies unites with the ⊕ with heat & effervescence producing a Glauber Salt — with the ⊖ it forms a cubic Nitre — with ⊖ common Salt, & with sedative Salt, it forms Borax — — As the effects of this Salt upon Earths, Inflammables & Metals are exactly the same as the effects of the Vegetable Alkali, we shall delay speaking of them 'till we come to treat of the Vegetable Alkali. I shall only remark that it dissolves in 6 times its

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weight of Water, It may be seperated from this Water by means of Evaporation, & afterwards crystalizeinto Crystals of an irregular Shape somewhat resembling ye Figure which Geometricians call a Rhombus. These Crystals contain a large quantity of Water, amounting to ⅔ their weight, which may be easily seperated from them by means of Distillation. — They undergo the Spontaneous Calcination when they are exposed to the Air. —

— As to the Origin of this Salt we shall only observe, that it has long been in Use, & was well known among the Ancients. We find it mentioned in the Bible under ye Name of Nitre. Solomon seems to allude to it when he says "to sing songs with a "heavy heart is like the mingling of Vinegar & Nitre". If we suppose he meant ye Neutral Salt we call Nitre the allusion is no way striking, but if we suppose that he ~~meant~~ alludes to the Conflict & effervescence which attend the mixture of Vinegar

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an Alkali; The Figure is very beautiful, & worthy of the Wise author who wrote it. — The Fossil Alkali is found in the soil of Egypt & in small Quantities in some mineral Springs — But it is procured in the greatest abundance in the Bowels of the Earth, & when it drives its name of Mineral or Fossil Alkali. It is the Basis of Glauber & common Salt. In order to seperate it from the Glauber Salt we must deflagrate it with some Charcoal. The ⊕ (which enters into the Composition of the Glauber Salt) in this operation unites with △ of the Coal & forms a ⊼. This unites readily with the Alkali afterwards & forms what is called a Hepar Sulphuris, which retains the Alkali so weakly, that it may be easily seperated from it by the Vegetable acid. This Acid may afterwards be seperated by means of Heat, & thus we obtain the simple fossil Alkali — In order to obtain this fossil Alkali from common Salt, we must ~~obtain the fossil~~ add the ⊖ to it. This unites with the Alkali of the common Salt & forms a Cubic Nitre. This Cubic

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Nitre. This Cubic Nitre must be deflagrated with Charcoal, by which means the ☉ will be dissipated, & a pure fixed Alkali remain behind. There is no other method of separating the ☉ from common Salt than this. See Lewis Comer of Arts page 643. These two Methods of obtaining this Salt are so troublesome & expensive that they are never employed when we want to obtain it in any large Quantity. Instead of these it is now procured from a sea weed ~~to~~ called Kali, or Kelp which grows upon the Sea shore. The Arabians were the first who extracted from this Plant. The Practice was for some time confined to Arabia, but it is now common in many Parts of Europe, especially in those Parts of Spain & Italy, which border upon y Mediteranean Sea, where the Plant which affords this Salt in the greatest Quantities grows plentifully. After this Practice was communicated by the Arabians to the Europeans, such of the latter as were not contiguous to the Sea Coast obtained their Salt from any Vegetables which their Country afforded, & consequently got

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the Vegetable fixed Alkali, instead of the fossil Alkali, for as yet they knew no Distinction between them — Mr Boyle was the first who pointed out a difference between them. After him we find Dr Stahl recommended to his Pupils an Investigation of the Properties of each. ~~This excited Chemists of other Nations~~ This however was neglected till Mr Du Hamel published a Dissertation upon the fossil Alkali. This excited Chemists of other Nations to make Enquiries, & it is now universally allowed to be a distinct Species of Alkaline Salts. In Great Britain this Salt is procured from all sy Plants, which are found on the Sea Shore. They are dried, burnt to ashes & afterwards lixiviated in the same manner as the Vegetable Alkali; the fossil alkali obtained in this manner is much used in making Spanish Soap & Glass, & in Bleaching. The Plant which affords it is to be found in large Quantities about Cape Honlopen, & in many other of the Sea Coasts of this Country. —

Of the Vegitable Alkali.

This Alkali is somewhat more acid, than the Fossil Alkali — It

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It undergoes pretty much y same Changes in y same degrees of Heat as the fossil Alkalies. But if the Heat is urged a good deal, the Acrimony of the Salt is considerably encreased by it. This Acrimony is owing to part of the fixed Air being drawn out from the Alkali — It is now said to be rendered Caustic — A Considerable portion of fixed air still remains behind, which no heat can dissipate, especially while we attempt to confine it in the ordinary Vessels which are employed for that Purpose — even ☉ & ☽ Vessels will melt before they acquire heat enough to complete the Operation. —

## Effects of Mixture —

1st it unites with all Acids in its mild State with Heat & effervescence, with the ⊕ it forms Vitriolated ♃ — with ⊖ — common Nitre; with the ⊖, digestive Salt. with Vinegar Sal Diuretic or Regenerated ♃. & with the Acid of ♃ — Tartar Solubile. — This you may see in your Table of Neutral Salts — But when this Alkali is rendered Caustic it unites with the

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the Acids without any effervescence — This is a plain proof that Effervescence is owing to nothing else but an Extrication of fixed Air. — A Case of single Elective Attraction always takes place upon mixing an & mild Alkali together — The Acid by its superior attraction to the Alkali dissolves it & dislodges the fixed Air which was before united to it, while the fixed Air makes its escape in the Bubbles we perceive during the act of Effervescence —

2dly It unites readily with most of the Earths — It renders some of them fusible which are absolutely refractory when put into the Fire Alone — Its effects upon the Calcareous Earths particularly upon Lime are very remarkable. After Lime has been burnt it becomes you know Quicklime. If 3 parts of this are mixed with one part of Mild Vegetable Alkali, the following Elective Attraction takes place. The Quicklime attracts the fixed Air from the Alkali & is immediately precipitated in the form of Calcareous Earths, having left all its acrimony by

attracting

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attracting the fixed Air from the Alkali, this you may see in your table of single Elective Attractions under the 5th Column. In the mean time the Alkali remains suspended in the Water in which it was at first dissolved – It has we find undergone a Change by losing its fixed Air – It is changed from a mild to a caustic state. This Water should be evaporated & the Caustic Alkali obtained in a dry form – This is the best method of Obtaining a Caustic Alkali – Great Care should be taken to keep it from the Air to prevent its Dilaquescing –

– 3dly It unites Readily with several of the Inflammable Substances – with ♃ it forms an Hepar ♃ris – This Hepar ♃ may be decomposed by any of the Acids. It unites with most of the Oils forming with them those usefull compounds we call Soaps. It is necessary that the Vegetable Alkali should be calcined a little in order to give it some Degree of Causticity. This enables it to unite more readily with the

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Oils — There is a Difficulty sometimes in procuring a Union of the Oils & Vegetable Ashes. To remedy this the Soap Boilers we find add a little Quicklime to them, which by attracting the fixed Air from the Alkali, & thus rendering it more caustic enables it to unite with the Oil. —

— It unites with very pure ☿ when it is caustic — In its mild state it unites with ordinary ☿ & dissolves in the Water which it contains — This method is useful not only for distinguishing the Presence of Water in Acid Spirits, but of seperating it from it. — —

— 4ly It dissolves none of the Metals except Lead & ♁ in their Metallic State. But it unites with most of them when they are precipitated from the Acids. It helps to promote the Fusion of all the Metals & afterwards unites with them — It promotes their Fusion most powerfully when they are in their Native State, or in their State of Ore; for by uniting with the ♃ which they contain it forms a Hepar ♃ which is one of the greatest fluxes for metallic

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tallic Substances we are acquainted with —
— 5ly It has a strong attraction to Water. It dissolves in an equal Quantity of it. So strongly does it attract Water, that it ~~is~~ deliquesces in the open Air. The Oliver Qtis for Deliquium is found in this manner. —

6ly The Vegetable Alkali in its Caustic State corrodes & destroys Vegetable & Animal Substances — It acts chiefly upon the Oleagenous & juicy Parts of Vegetables, in which their Color mostly resides; hence its great usefulness in bleaching of Linnen as we shall say hereafter. Its action upon animal Bodies in corroding & destroying the Flesh is well known to you all. It is particularly useful in taking films from the Eyes — for it always ~~dea~~ ~~tage~~ destroys inorganic, much sooner than the Organic Parts of the Body. It is a speedy solvent for Mucus, & hence it has of late been used with success in recent Gonorrhoeas by way of an Injection, for a simple Gonorrhoea is nothing else but a too

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too plentiful ~~secretion~~ Secretion & Excretion of the Mucus of the Urethra, occasioned by the Stimulus of the Venereal Poison. The Caustic Alkali should be used for this purpose only in the ~~state~~ state of this Disorder when we are sure there are no ulcers in the Urethra. – This universal power which the Caustic Alkali possesses of dissolving Animal Substances, has led us to an easy method of procuring O & D from old Silk Cloaths & lace of all kinds. – Silk we know is animal substances. Now if the Cloaths or lace containing of Silk are thrown into the Caustic Alkali, the Silk is dissolved intimately, while the O or D fall to the Bottom in their original state, & are afterwards fit for any other Purposes we are pleased to apply them to.

## Natural History of Vegetable Alkali.

This Alkali is obtained from Tartar as we said before by calcining it in a close Vessel. The purest Alkali is obtained in this manner. It is likewise ~~of~~ obtained from Nitre by deflagrating it with charcoal

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charcoal — & a little Tartar. We shall describe the Method of ~~doing~~ procuring it by this Process — when we come to treat of Nitre — The operations for procuring the Vegetable Alkali from ℔ & Nitre are so ~~[illegible]~~ troublesome & expensive that they are now but little practised. It is now obtained chiefly from the Ashes of Vegetables. The Salt we call Pot-ash is nothing else but this Vegetable Alkali — As this Substance is now become a considerable Article of Trade in this Country, & as y greater Perfection in the Manufacturing of it may tend to encrease this Trade, it will not be amiss to stop a little, & consider y manner in which it is prepared, as also y means of obtaining it in the greatest ~~Perfection~~ Quantity & Purity. we said that this Salt is procured from the Ashes of Vegetables. The Quantity of these Vegetables therefore should be attended to in the first place. The solid, bitter & astringent Woods yield it in the ~~greatest~~ largest Quantities, for this purpose. Red — White & black Oak are generally ~~prepared~~ pared.

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ferred to all others. Wormwood affords the most of in proportion to its Quantity of Matter of any of the Vegetables — The light Woods such as Pines &c yeild this Salt in very small Quantities. The Wood for making Potash should be cut in the Spring of ye Year about the time the leaves ~~begin~~ to sprout. — Dry wood should never be used for making of Potash. In Hungary it is a common thing to cut down whole Forests on purpose to employ the Wood for Potash, out of 250 Bushels of the Ashes obtained in this manner they generally make one Ton of Salt. During ye ~~Begin~~ Burning of the Wood, we must be careful not to admit too much Air to it, or we shall dissipate the Ashes, nor should we exclude it too much least we reduce our Wood to a charcoal instead of Ashes. The Inflammation should be carried on very gradually in order more completely to expel △ from the wood, for this by remaining is one of the Causes of the Impurities of the Potash — From this we see the Reasons of the great Inferiority of ye Potash of this Country to

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to that which comes from Russia, Denmark & the Northern Parts of Europe. The Ashes we employ here are taken from our Hearths, where all kinds of Wood are burnt without any of those Distinctions or Cau=tions we spoke of. With these the Sweepings of our Hou=ses are mixed from Day to Day, which, as they contain many foreign Matters in them, add greatly to the Im=purity of the Salt so that instead of getting a Ton of Potash from 250 Bushels of Ashes, as they do in Hun=gary, we think ourselves well paid for our Trouble when we get that Quantity from 4 or 500 Bushels of Ash=es. In some Cases 700 Bushels have not yeilded that Quantity. The manner in which the Salt is procured from the Ashes is well known to you all. The Water which is poured upon the Ashes for this purpose should be as pure as possible. River & Rain water are to be preferred to pump & Spring Water, as they dissolve much more of the Saline Parts of the Ashes, & convey no foreign Mat=ters into them. After the Ley has evaporated, & the Salt crystalized, it is a common Practice to raise the Fire

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so as to fuse the Salt as it is called. This is done in order to take it out more easily from the Vessels in which the Crystalization was performed — The Potash is now put into Barrels, & is supposed to be fit for Exportation or use. — Before we examine into the means of purifying this Salt, it may not be amiss to enquire from whence the Salt is derived? Did it pre-exist in its native state in the Wood? Or is it pro-duced by the action of the Fire? Fire we know pro-duces many Changes in the Properties, as well as in the Arrangement of the Particles of Bodies. Many things we see are produced by analyzing Substances, which we are sure did not formally exist in them before. This we prove from the Order in which these Component Parts of Bodies rise in Distillation. Thus Oil we see often comes over before Water — & water before Air. — This should teach us to be extremely cautious in inferring any thing concerning the Elementary Principles of Bodies from Chemical Analizes. But with Regard to the Vegetable Alkalies we have

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undoubted Proof of its formal Existance in the wood: ~~Lee~~ before it had undergone the Action of the Fire. Mr. Baume made a number of Experiments upon Plants, with a View of deciding this Question, & tells us that he found a large Quantity of it in a Plant, which he calls the Corona Solis, which appears to be the same as our common Sun-Flower. Mr. Margraaf succeeded in like manner in finding a fixed Vegetable Alkali in Plants in their native State. He infused a Piece of Wood in which he suspected the Presence of this Salt into some of the Ox for the same time, and found a common Nitre formed from it. — The Ox attracted the Vegetable Alkali from ye Wood in order to form the Nitre —

— Let us now enquire into the Methods of purifying this Salt. The foreign matters which adhere to it are 1st an over proportion of Inflammable matter which was not consumed during the Burning of the Wood 2dly Too great a Quantity of Earthy Matters. — 3dly Several Saline Matters which being equally fixed with

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with the Vegetable Alkali resist the Action of the Fire — These Saline Matters are generally a Glauber Salt — a Vitriolated ♃ common Salt — Nitre — & lastly the fossil Alkali —

A 4th Matter which mixes with the Vegetable Alkali is Iron — This is so plentifully diffused thro' Plants, & so closely combined with them that Lemery has extracted it from Honey itself which we know is of Vegetable Origine — Mr. Geoffroy tells us that it abounds in Vegetable ~~Origine~~ Ashes of all kinds — as it is soluble in the fixed Alkali, ~~tho~~ in its calcined state it unites the Ashes to it, & cannot be separated from it without a good deal of Difficulty — —

The Presence of too great Quantity of Δ may be known 1st By the Color of ye Potash which is not so white as it should be. When it is dissolved in water it appears more or less Yellow — or red instead of being altogether without Color — 2ly By its smell, which is always more pungent in Proportion to the Quantity of Δ it contains, & 3ly By its state of Causticity which

which is always less in Proportion to ye Quantity of Δ mixed with it —

There are two Methods of Separating Δ from Potash — The 1st is by means of Calcination in the open Air. This in time dissipates ye Δ — The 2d Method of Separating Δ from it, is to present to it some Body, upon which it has no Action, but which has a stronger attraction to Δ, than to the Alkaline Salt. — Mr. Baume contrived a Silver Vessel for this purpose in which he put the Potash dissolved in Water, & placed it over ye Fire to evaporate. After some time he found the Color of ye ☽ to be tarnished, in proportion as this took place, he perceived ye Ley to be changed to a white Color. The Salt obtained after all the Water was evaporated from it, he found to be pure — Caustic — & entirely deprived of all its superabundant Δ —

The Presence of Earthy Matter in Potash may be known 1st By the Residuum it leaves after Calcination — & 2dly By its saturating a lesser Quantity of an acid than is Natural to it in its purest state.



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It adheres very weakly to the Alkali & may be easily separated from it By one or two Dissolutions & Filtrations —

Neutral Salts of all kinds may be separated from Potash by means of Crystalization; of all ye Neutral Salts, none is found so frequently mixed with Potash as common Salt. In ye Potash made in America it is easy to account for its containing so much of this Salt. The Sweepings of our Kitchings are a fruitful source of it — It is very hurtful to the Potash, & according to Dr. Home of Edinburg, injures Linnen very much in Bleaching by Opening, thinning & weakening it. The Presence of Common Salt & other Neutral Salts in Potash, Dr. Lewis tells us, is distinguished by their being thrown down from their Solutions by Spirit of Wine, While the proper Alkaline Salts continues dissolved. A saturated Solution of pure Alkaline Salt (he tells us) being shaken in a Vial with an equal Quantity of rectified Sp, the two Liquors separate on standing for a moment, the Spirit produced an opake Milkiness in ~~the Alkali, leave Spirit pur~~ the Lye, & on standing

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ding for a few Minutes, a Saline Matter seperated, & fell to the Bottom, sometimes in a powdery & sometimes in a pure crystalized Form. Another Method proposed by Dr. Lewis for distinguishing the Presence of common Salt in Potash, is if it be fully saturated with pure Aqua Fortis, minute Portions of common Salt may be discovered by adding a Solution of D or Lead to it. The whole Solution immediately becomes Milky. The Ley must in this Case be made of River or Rain Water, as all Spring or Pump Water contains common Salt and in them to occasions this milkiness in these Solutions.

— The Presence of common Salt in Potash is not easily found out, & when detected, is not easily seperated from it. It is seldom combined with it in such Quantities as to do mischief

— After all the Methods we have recommended for purifying Potash we must acknowledge they are sometimes insufficient for the Purpose — If the Direction we laid down for making the Potash, are carefully followed there will be no occasion for any further Operations in order to purify it. Dr. Lewis has Contrived what he calls a Hydrostatics Essay of Potash

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in which he has determined the Quantity of pure alkaline Salt contained in a given Quantity of Ley. But the Discription of this Instrument belongs to the Mechanical & not to the Chemical Phy-

losophy —

As we have said so much concerning Pot-ash it will not I hope be looked upon as foreign to our present Subject to say a few ~~things~~ Words upon the Art of Bleaching. This being the principle Art in which Potash is employed. —

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# Lecture: 20th Bleaching.

It is carried on differently in different Countries. In Holland it is supposed to be carried on in the greatest perfection, hence we find the Linnens, which come from their Country, are generally the whitest of any Linnens in the World. The first Process they undergo, is to be put into a large Tub, of Warm water, with fine Bran, or Barly mixed with it. Here they lie for 30 hours till the Bran & Water have undergone a compleate Fermentation, & all the Scum formed upon the surface of ye Water falls to the bottom of the Vessel. after this they are well washed in a Mill contrived for that Purpose, & then exposed for several Days to ye Action of the Dew & Sun, in a Field, which they call a bleaching Green. From hence they are carried back, & boiled for several Hours in a ley made of Potash dissolved in Water, & then returned to the Bleach Green again. This Operation is repeated 16 times — The Strength of the Ley in which the Linnens are boiled should gradually be encreased the first 8 times they undergo this

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this Operation, the last 8 times they are boiled the strength of the Ley, should be gradually deminished. This may be called the 3d Process they undergo. —

The 4th Operation upon the Linnens is to steep them sometime in Butter Milk, or sour milk & Water — In some Countries particularly in Scotland the Ox is used instead of Butter Milk, but as it is apt from its specific Gravity to fall to the Bottom of the Vessel, in which it is poured before it is mixed with the Water, it very often corrodes the Linnen. After they have laid in the Butter Milk five or six Days, they are taken & thrown into a Rivulet of Water, where they lay till all the Foulness they contracted from ye butter Milk is washed away — When this is done, they are washed in Soap & Water, & this finishes the Operation of Bleaching — —

— As our Business is rather to study the Philosophy than the Practice of the Arts, we shall now enquire into the Reason of the several Operations of Bleaching. & 1st The Fermentation which the Linnens undergo in the Bran or Barley serves to detatch the coloring Matter

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from them. The Alkaline Ley by combining with this coloring Substance in the Linnen renders it soluble in Water, & thus prepares the Way for its being washed out from them. The Acid completes the Bleaching of the Linnens by further seperating the colouring Matter from them. the same Effect we see obtains in the Bleaching of Wax. The Acid which the Wax contains in it, seperates when it is exposed to the Action of the Sun & Air, & carries away with the colouring Matter, & we shall show you hereafter is nothing else but the pure Water. —

— The Acid has a further Action upon the Linnens, & serves to neutralize & destroy any Particles of the Alkaline Ley which might remain in them —

This Salt Besides being used in Bleaching, is employed in making of Soap & Glass, but we shall defer treating of these Articles till you are better acquainted with all the Materials which enter into their Composition. With this we finish our account of the Vegetable Alkali — we proceed now to treat of the

Volatile Alkaline

This Salt possesses all the Characters of the other alkalies

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Alkalies in respect of its Relation to acids & the Syrups of Violets, but then it differs from them in being more Volatile & possessing more Acrimony. The Effects of Heat & mixture are likewise different upon it. In the first it emits a Volatile Vapor. A very inconsiderable Degree of Heat is sufficient for this Purpose. If this Vapor is confined it forms itself into a solid Concrete, which we call Volatile Salts. The Vaporific Point of this salt is far below its Point of Fluidity —

Effects of Mixture —

1st It unites with the ⊕> forming a Neutral Salt, which is called Vitriolic Ammoniac, or Glaubers Secret Sal Ammoniac. It unites with ye ⊖> forming ~~a Nitro~~ with it a nitrous Ammoniac — The Nitrous Salt is possessed of a Property of exploding in a certain Degree of Heat. This depends upon the Δ which is always present in the Volatile Alkali — With the ⊖> it forms common Sal Ammoniac. & with the fermented acid — Spiritus Mindereri — — It unites however so feebly to these Acids that it may decomposed by either of ye fixed Alkalies. —

— 2dly It has but a slender Attraction to earthy Substances.

— 3dly It unites with several of ye inflammable Substances with

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with ♃, it forms a Hepar ♃ris. It unites readily with all the essential Oils, forming with some of them that fine fragrant Substance we call Eau de Luce. It unites with difficulty with the expressed Oils & forms with them a coarse kind of Soap. If ☿ is added to a solution of this Salt in water part of the ~~Water~~ Salt is immediately precipitated — This is owing to a single Elective attraction — the ☿ having a stronger attraction to the Water than the Salt attracts it from it, & leaves it to fall to the Bottom —

2ly It unites with several of ☿ Metals in their calcined state. It precipitates Copper from its solution in Acids, & dissolves it intimately forming ~~and~~ with it a beautiful ~~blue~~ blue Color — This we shall describe when we come to treat of Copper. —

3ly It dissolves readily in Water, & when this Water is suffered to cool, & is confined at the same time, it Drops Crystals; but if the Water is exposed, so very Volatile is the Salt that it flies off & leaves ☿ Water. It generates Cold when it is dissolved in Water in its mild state & heat in its Caustic state —

6ly It does not act so quickly or powerfully upon Vegetable or animal Substances as the other alkalies. — This depends upon

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upon its great Volatility which prevents its being confi-
-ned long enough to act upon their Substances. —

— As to ye Natural History of this Alkali it is
seldom found in a simple state. It is the product of Pu-
trefaction, & is obtained sometimes in a Native state
in the Neighbourhood of putrefying Bodies. It may
be secreted distinctly in Stables, when the Dung is mo-
-ving especially if it has laid for some time. Some Phy-
-sicians have recommended this Odor to their Patients, in
complaints of the breast; had they known that all its
Virtues resided in the Volatile Alkali which it extri-
-cated — they might have prescribed this Remedy in a
more elegant form. If a Quantity of the ⊕> ⊖> ⊖> is
exposed to this Alkali — a Neutral ~~Sall~~ Ammoniacal
Salt will be formed according to the Nature of the acid
we employ — This Salt is likewise procured from
the Hoofs — Bones & other Solid Parts of Animals by
simple Distillation without addition. — The Marta
Horn was supposed to yield it in the largest Quanti-
-ties — hence all the Volatile Salts obtained from Ani-
-mals Substances are called Spiritus & Sal Cornu Cervi.

— See

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-ge an ~~account~~ accurate account of the Process for obtaining the Volatile Alkali in this manner in the new Dispensatory & in Margquares Chemistry. —

But the Volatile Alkali is chiefly obtained by the Chemists from Sal Ammoniac. This as you may see in your Syllabus is formed from a union of ☉ & Volatile Alkali. It may be decomposed by a fixed Alkali — Calcareous Earths — & metallic Substances — If a fixed Alkali is employed, we obtain oftentimes 2/3 or 3/4 of ye weight of the Sal Ammoniac in the Receiver. This curious Fact has long been Observed by the Chemist, & many attempts have been made to explain it. Du Hamel supposes that a quantity of ye fixed Alkali we add to the Sal ammoniac is volatilized & rises with the Volatile Alkali. Margquare we find has adopted this Opinion. The Discoveries which have lately been made with Regard to fixed ~~Alkali~~ Air, have led us to attribute it to Volatile Alkali of the Sal Ammoniac, attracting the fixed Air from ye Vegetable Alkali which was used to decompose it &

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carrying it over into the Receiver. —

— The same Phenomenon takes place if we employ stone Lime to decompose Sal Ammoniac — If we add ℔j of unslacked lime to ℔j of Sal Ammoniac, we shall obtain ℔j of Volatile Salt. This in like manner depends upon the Volatile Salts attracting & carrying over with it the fixed Air of the Lime. If we employ Slacked ~~unquick~~ lime to decompose the ~~Quick lime~~ Sal Ammoniac, we shall observe no such remarkable increase in ye Weight of the Volatile Alkali. It rises in a fluid form, which is owing to its attracting Water from ye Quick lime — It is likewise remarkably caustic — This is owing to its having no fixed Air to attract from the Quick lime, for ye Quick Lime parts with its fixed Air when it is slacked. —

— The Volatile Salt which comes from England is generally obtained by means of Chalk — & hence arises its beautiful White Color. The Metallic L. are never used to decompose ye Sal Ammoniac —

In the Distillation which is going on before you, ye Vegetable Ammoniac. 2 parts of ye former to one of ye latter

are the best Proportions. A Quantity of Water equal to the Vegetable Alkali, is added when we want to obtain it of an Ordinary strength fit for Medicinal Purposes. But if we want it stronger than this, we must add much less Water, & we must employ some apparatus for ~~exploding~~ retorting ye Volatility of the Spirit which we use for condensing the Vapor of ye Or. This strong Spirit of Sal Amoniac is used only for Making Eau de Luce.

* With this we finish the Chemical History of the Alkaline Salts — & here we may remark as in the Case of the Acids that there appears to be only one primogenial Alkali & that the difference we have pointed out among them arises from their being combined with foreign Matters. The Fossil Alkali owes its specific Qualities to its being combined with some Bituminous Substance — The Vegetable Alkalies — owes its specific Qualities
26. to its being united with some Vegetable Matters — & the Volatile alkali — Its volatility to being united to some Subtle Matters, which abounds with the Δ. That this is really ye Case we prove from the Facility

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:lity with which we change a fixed into a Volatile Alkali. Thus if we collect the Fumes of Nitre or Hepar ♃ris while we deflagrate it with Charcoal, we shall find them changed into a Volatile Salt. — Vitriolated ♃ in like manner if digested for any time in ♀ is changed into a Vitriolated Ammoniac — the fixed Alkali of ye Vitriolated ♃, being here converted into a Volatile Alkali —

Before we conclude our account of Alkaline Salts in general, we shall add a few Words concerning their use in Medicine. The Alkaline Salts were long supposed to be powerful Septics. Dr Huxham has taken great Pains to show us, that they induce a Putrefaction in the Blood, & has mentioned several Cases in which an universal Differatio, or Dissolution of its component Parts, appears to have taken Place. Sr John Pringle on ye other hand, has proved

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proved by a number of Experiments made upon Animal Substances out of the body, that these Salts instead of being Septic are powerfully antiseptic or resist Putrefaction. How shall we reconcile these two Authors? For my Part I must say that I have as high an Opinion of Dr. Huxhams veracity in relating Facts, as I have of Sr. John Pringles Ingenuity in making Experiments. It does not follow by any means that Alkaline Salts are antiseptic in the Body, because they are so upon animal Substances out of the Body. We must remember they are possessed of a strong Stimulus, ~~and they are possessed of a strong Stimulus~~, & as they come immediately in Contact with the moving Fibres of the Body, they encrease their Actions so much as to make them act powerfully upon the Blood, on which they produce effects analagous to a putrid Dissolution of it. This Accounts for Dr. Huxhams

Mistake

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Mistake with regard to the Septic Qualities of these Salts. It likewise shows us the Absurdity of supposing that the human Body is like an Alimbic, or Retort in which Operations go forward with the same Exactness as they do in these Instruments out of the Body. Sr John Pringle tells us that he found Chamomile Flowers to be a more powerful Antiseptic out of the Body than the Peruvian bark. Does it follow from hence that it is a better Medicine in putrid Fevers than Bark? Experience convinces us that it is not. Why therefore should Sr John apply his Experiments to the human Body in one Case & not in another? I leave it to those to answer this Question, who are carried away with the Appearance of Novelty without enquiring into the Probability or Truth of Facts. What now are the Medical Virtues of the Alkalies? – They are said to be powerful Medicines in Calculous Disorders,

especially

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especially when they are rendered a little Caustic. In what manner Alkaline Salts are rendered caustic, I shall explain to you hereafter, when we come to treat of fixed Air. — I cannot think for my part they have the least power in dissolving the Stone or calculous Concretions. For in the 1st place, I believe 9 times out of ten, or rather 99 times out of an 100, they are neutralized by the Acid they meet with in the Stomach. But supposing they should not be neutralized in the Stomach, how is it possible they should enter the Lacteal Vessels, which we know are endowed with a wonderfull Sensibility, which causes them to contract when any acrid substances ~~approach them~~ touch them. — But supposing still further, that they had passed thro' the Lacteals, they immediately become so diffused throw the Body, that before they arive at the urinary passages, they are rendered as mild as the Urine itself.

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itself. — But some of you perhaps will say that you have known Instances in which these Medicines have cured calculous Complaints — This I shall not deny; I think I can say from my own Observation, that I have seen them do considerable service in the Stone — In these Cases — they ~~act~~ operate either 1st by altering the state of the Kidneys in such a manner, as to alter the secretion of the Urine, so as to make it act as a solvent upon the Stones. This happens in those Cases, where little Particles of Stone are discharged from time to time, during the Use of these Medicines — or 2dly They operate by enducing an Insensibility, in the Kidneys & Bladder, to the Stimulus of the Stone. It is in this way I believe they generally produce their effects — Dr. Hunter Used to tell us in his Lectures, that a Stone was found after Death in the Bladder of that very Person, for the supposed Cure of whom Mr. Stevens received 5000 pounds from the Parliament —

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Besides this Dr. Haen tells us that in several Cases he had under his Care, after all the Symptoms of Calculi were removed by the use of Alkaline Salt, he felt the ~~the~~ Stones with a Catheter, unaltered both in Size & Shape. —

— Alkaline Salts have further been given as Sudorifics. Here they act entirely as Neutral Salts, for they are always changed by the Acid they meet with in the Stomach — If they should not be satu=rated by the acid in the Stomach, they generally prove too heating & irritating for most of Constitutions. — We have so many more valuable Sudorifics in the Materia Medica, that we need seldom have recourse to alkaline Salts in Any Cases whatever.

— We have a remarkable account lately published in the Memoires of the Royal Academy of Sciences by Mr. Jussieu, of a Student of Medicine who was poisoned in collecting Plants, insomuch that he

 was

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was expected every moment to Die; who was perfectly cured by taking large doses of the Volatile Alkali. —

In this Case, it acted as a Stimulant to the Nervous System; on which all poisons which operate suddenly, appear to operate principally. It have since been recommended in France in all Pestilential Fevers, which attack & produce their worst effects suddenly. This is one of many Facts which shows us the great analogy between certain Poisons, & the Miasmata which produce certain kinds of Fevers. —

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# Lecture 21st

## Of the Neutral Salts

Having finished our account of the Simple Salts, we come now to treat of the compound Salts. They are composed of two Simple Salts, & as they partake of ye properties of neither, after their Combination they are called Neutral Salts. The Number of them has been supposed to be very great. This was owing to the Chemists being Ignorant of the Nature of their own Science, & imagining that every new method of making a Neutral Salt, gave it some new specific properties. — The many Synonymous Names which most of the Neutral Salts bear, is a plain proof how very numerous they were supposed to be, as each Name stood with them for a distinct Species of Salt. — The Number of them will be very much limited when we consider 1st that a compound or Neutral Salt, cannot be formed from an acid, attracting

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attracting an Acid, nor, an Alkali an Alkali, nor 2ly
can a Neutral Salt be formed unless these two simple
Salts are united together in a certain determined pro-
portion. When the Salts are united in this manner they
are said to be saturated, & the exact point at which the
Neutral Salt is formed is called ye Point of Saturation.
It is of great importance ~~to know~~ in making a
neutral Salt to hit the Point of Saturation. 1st the
Diminution of Effervescence is generally looked upon
as a mark of the two simple Salts being saturated, but
this is far from being invariable, for the Particles
of each Salt often get beyond the Spheres of each
others attraction, so that they cannot unite intimately
together. Agitation it is true will help this, but the
Vessels in which Neutral Salts are made are sometimes
so situated that we cannot shake them. Besides Effer-
vescence we said depended upon the Extrication of fixed
Air from the Alkaline Salt. — In these Cases therefore

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where the Alkali happened to be a little more Caustic than ordinary, the effervescence will cease long before the Alkaline Salt is fully saturated with an acid.. 2dly The Taste will help us a good deal in determining when a Salt is neutral – The acid is known by a sower, & the Alkali by a urinous taste. But this is liable to some objections since the Taste sometimes blend, & run so much into each other like shades in Painting, that it is impossible to distinguish exactly the Acid – Urinous – & neutral Tastes from each other. The best method to find out, which of the two simple Salts prevails, is to take some paper, & dip it into some of the Syrups of Violets, & then tear a piece from it, & dip it into the compound or neutral mixture we are making. If it tinges it of any color (which we may easily find out by comparing it with the paper we tore it from) we may depend upon

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upon it one of the two Salts prevails. But in many Cases it is not necessary to be so very accurate in hitting the point of saturation —

— Thus for Instance in those Compound Salts, which are made with the Volatile Alkali, the Alkali is soon dissipated, in evaporating the Water before the Salt is crystalized — If an acid prevails in a compound Salt, it may be separated likewise in Crystalizing the Salt, for most of the Acids in their simple states are incapable of assuming a solid form — You are not to suppose by our giving these Directions to make Neutral Salts, that all Neutral Salts are artificial. They are often formed by Nature as we shall say hereafter in treating of the particular Neutral Salts —

— The Neutral Salts differ from simple Salts in the 4 following properties. —

1st They have less acrimony —

2dly They act but feebly on Inflammables —



3dly

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3ly They have little or no attraction to Water, & suffer water to be evaporated from them.

— From ye Diminution of ye seperate Powers of the simple Salts, when they are united, many have tho't that acids & alkalies were contrary to each other, & that they lost all their Force by being combined together. — But this is by no means the Case — For when they are disunited, they regain all their former Properties, & act as readily upon Earths, Inflammable & Metallic substances as formerly, so that what happens to them in Consequence of their Combination, is no more than what happens in all other Cases where the attraction of two substances for other things is allways deminished in proportion, to their Attraction to each other. —

The Compound Salts are limited to 18 — 14 of which are set down in our Table of Neutral Salts. In this Table ye acids & alkalies

point

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point respectfully to the Neutral Salts which they compose. The Vitriolic Compounds are placed in the first Column immediately under the ⊕♃. The Nitrous Compounds are placed in the second Column under the ♃ & so on of all the rest. They each of them point to those alkalies which compose them on the same Line with themselves. The simple Salts are set down in the Table, according to their Degrees of elective attraction. Thus if we want to seperate a Volatile Alkali, from an Acid, either of the fixed Alkalies may be added. There is no Line interposed between the fixed Alkalies on Purpose to shew that this Power of attraction is the same, & that they equally seperate ♃ ⊕ from any Combination with an acid. The Acid Salts are likewise placed in the same Order. The 1st Column seperates the second, the 2d the third, & the 3d the fourth & so on of all the Rest. The 1st

seperates

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seperates the whole. There is one seeming objection we grant to these general Remarks upon the Relation of the Salts to each other — &c, that Sedative Salt is capable of decomposing Nitre & common Salt. This we took notice of in our history of this simple Salt. But we must remember here, that this elective attraction depends entirely upon Heat. All the other Cases of Decomposition take place in ij Coldt. Some have objected further to this Table, & have said that the ☉ may be seperated from ♃ by all the Acids, even the Weakest of them which are obtained from Vegetables — This may be & yet the Truth of our Table not be called in Question. — For the Design of it is to point out the Relation which the simple Salts have to each other & not to Inflammable Substances. — —

— Let us attend to each of the Neutral Salts more particularly & first of Glauber

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Glauber Salts. This Salt is composed of fossil Alkalies & ⊕. It appears in the Form of Pyramidal Crystals, having two acute & two obtuse Angles — If these Crystals are exposed to ye Air they undergo what is called the Spontaneous Calcination — This Calcination is one of the best marks of its ~~Clear~~ Purity. The Salts which we buy from the Druggists seldom undergoes this Calcination, altho it is exposed ever so long to the Air. It is further known by a disagreeable Taste. —

— By Heat — this Salt undergoes what is called the Watery Fusion (cc) all its Water is dissipated from it. This we shall illustrate by a simple Experiment. — The Crystals of this Salt we said formerly contained ½ of water in them. —

Effects of Mixture. —

1st It is changed by the Acid & Alkaline Salts

2ly

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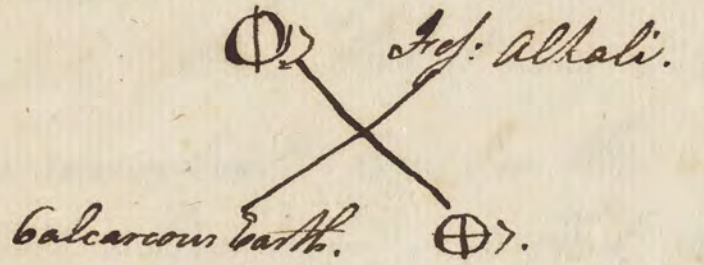
2ly It has no remarkable effect upon Earthy Substances. If a Solution of it in Water, is added to a saturated Solution of calcareous Earth in ⊖7, a double elective Attraction will take place.




3ly Of the Inflammable Substances. It acts only upon Charcoal — If it is ~~[illegible]~~ deflagrated with a certain Quantity of Coal the ⊖7 of the Glauber Salt unites with the Δ of the Coal & forms a true ♃. — This by uniting with the fossil Alkali of the Glauber Salt forms a Hepar Sulphuris. This Hepar ♃is may be decomposed by any of the Vegetable Acids. It is by dissipating this acid afterwards that we obtain the Fossil Alkali. The operation is very troublesome, & seldom succeeds unless the Operator has

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has been a good deal used to it. It was first taught us by Dr. Stahl — Before his time the Decomposition of Glauber Salt was a problem which had ~~[illegible]~~ puzzled most of ye Chemists in Europe. Dr. Baume has lately told us that it may be decomposed by distilling with a concentrated ☉y. In this Case it is the Δ of ye ☉y alone which acts — so that this method of decomposing Glauber Salt is nearly the same as that taught us by Dr. Stahl. The principles are the same tho' the Practice is different. —

4ly It has no action upon any of the Metals in this simple State. It precipitates some of them from their Solution in the acids by means of a double elective attraction. The ☉y of the Glauber Salts attracts the Metals while the fixed Alkali unites to the Acid from which the Metal was precipitated. This is another Method of decomposing Glauber Salt. —

5ly It dissolves readily in Water. When the Water is warm it dissolves (according to the Author of ye

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Dictionaire de Chymie —) a quantity of this Salt equall to itself in weight. When the Water cools the Salt is deposited in the form of beautiful transparent Crystals. The Transparency of the Crystals depends upon the Quantity of the Water they contain. All Crystals of Salts being more or less transparent according to the Quantity of Water which enters into their Composition. —

6ly It has but little action upon Vegetable & Animal Substances —

— As to the Origine of this Salt, it is for the most part an Artificial Substance. — It is sometimes found in a native State in plants, on old brick Walls & in mineral Waters. But it is for the most part obtained by decomposing common Salt by means of ⊕ 7. This you saw in our process for making the ⊖ 7. — The Residuum which was left behind after the Dessipation of the ⊖ 7 was a true Glauber Salt. —

— It may be obtained in like manner, by decomposing the Sal Rupellens, or the Borax by means of

q ⊕ 7

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⊕ or its Compounds – But it is chiefly procured at present by mixing the pure fossil Alkali – obtained from kelp with the ⊕. This Method of making Glauber Salt was first discovered by the Society for improving Arts & Manufactures in London. It is now used by the trading Chemists in London to great Advantage. –

## Of the Vitriolated ℞. –

This Salt is composed of Vegetable alkali & ⊕. – Its Crystals differ from those of Glauber Salts, in having 4 Columns, each of which are joined by right Angles, which end in a Pyramid. They are moreover less transparent than ye Crystals of Glauber Salts & of course contain much less water. –

– The effects of Heat are not very remarkable upon this Salt. It will not undergo the watery Fusion, nor can the Water which is contained in ye Crystals of this Salt be dissipated unless they are made red hot.

### Effects of Mixture.

1st. This Salt suffers no change by being mixed with

acid.

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acid or alkaline Salts —

2ly It has no remarkable attraction to earthy Bodies.

3ly It has the same Relation to Δ as Glauber Salt, & may be decomposed in the same manner by deflagrating it with charcoal —

4ly It has no action upon Metallic Substances in their simple state. But if it is added to a solution of ☽ in ☉, a Decomposition in Consequence of a double elective Attraction takes place. The ☉ deserts ☽ ~~which~~ in order to unite with the Vegetable Alkali of the Vitriolated ♃, while the Vitriolic Acid unites with ☽ which is ☉ deserted. — —

— Dr. Stahl for a long time puzzled the Chemists of Germany, by proposing a problem to them, a method of decomposing Vitriolated ♃ in the Palm of the hand. The method he used to accomplish this, was that we have now described. —

5ly It is difficult of Solution — requiring 16 times its Weight of Water to dissolve it. —

6th

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6th It has no remarkable action upon Vegetable or Animal substances. —

— As to the Origine of this Salt, it is sometimes found in a native state in the Juices of Plants, & is often found in the Vegetable Alkali or in Pot-ash. — In this last Case it is probably produced by the action of the Fire. It is however for the most part an Artificial Production. The methods employed by the Chemists for obtaining this Salt are 4; each of which we shall mention particularly. —

The 1st is by taking the Acid & Alkali in a Seperate State. This is done when we pour pure ⊕ upon Vegetable Alkali till they arrive at the point of Saturation.

The 2d is by taking the Acid & in a seperate & the Alkali in a compound state. This is done by distilling the ~~Vegetable~~ ~~the~~ ⊕ with Nitre, — digestive Salt — Regenerated ♃ — Nitre par ♃ris & Soaps made with Vegetable Alkalies.

The

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The 3d Method is by taking the Acid in a compound & the Alkali in a simple state. This is done by distilling the Vegetable Alkali with vitriolated Ammoniac, — with blue-green & white Vitriol, with Alum, & all the other Combinations of ⊕ with Earths of all kinds — & lastly with ♃ —

The 4th Method is by taking the ⊕ & ♃ vegetable Alkali both in a compound state. This is 1st done by distilling the Vitriolated Ammoniac, with all the Neutral Salts composed of the Vegetable Alkali — & 2dly by distilling all the Vitriols, — all the Combinations of Earth with ⊕ & ♃ with Nitre. —

~~The 4th Method is by taking the ⊕ & the Vegetable Alkali~~

The 1st method is seldom employed upon the account of the great difficulty of hitting the exact point of Saturation —

— The 4th Method is very troublesome, & seldom used in obtaining the Vitriolated ♃; for in the first Case if we distill the Vitriolated Ammoniac

with

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with the Neutrals, compounded with the Vegetable alkali, We obtain a Vitriolated Tartar it is true, but then the Ammoniacal Salt, which we obtain in Consequence of this adheres so closely to it, that it cannot be seperated without an intense Heat — If as in the second Case we distill any of the Vitriols, for instance green Vitriol & Nitre together the Degrees of Heat necessary to seperate the Vitriolated ♃ from the new Combination of ♁ & ~~Iron~~ Iron, are so great that few Vessels will bear the Operation. Upon this account the 2d & 3d Methods are generally employed in preparing this Salt. The Method we followed was the 2d i.e. distilling ⊕ & Nitre together. — —

Lit: 22d.

# Lecture 22d.—

## Of the Vitriolated Ammoniac.—

This Salt is composed of ⊖ 7 & 8. It has a penetrating, fragrant Taste. By heat it readily melts, & when exposed to the fire in a Retort, it rises unchanged into a Receiver.—

— Effects of Mixture.—

1st None of the Acids acts upon this Salt.— ~~It~~ It may be decomposed by either of the fixed Alkalies. When the fossil Alkali is employed we obtain a Glauber Salt. When we use the Vegetable Alkali we obtain a Vitriolated Tartar.

2ly It has little or no action upon ye Earths, ~~either~~ ~~simple~~ in their simple State.—

3ly Nor can it be decomposed like the other two neutral Salts we treated of, by Combining it with charcoal, as it will not bear heat end without evaporating. It unites however with ♃ & forms a Substance somewhat resembling in its appearance & properties Hepar Sulphuris —

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4ly It acts upon, & either corrodes, or dissolves all those metals which the ⊕ acts upon a separate State. It dissolves ☽ after it is precipitated from aqua Regia; Iron, Zink, Lead, & Tin unite with it, when they are fused together — Some of them become soluble after this in Water. If it is distilled with Copper it elevates a considerable portion of it into the Receiver. — Its great Power in elevating & volatilizing not only this, but several other of the Metals, gave occasion for Glauber to call it the Eagle Salt. The ⊕ which it contains (he says) are its Talons, with which it fixes upon y^e Metalic Substances, & its Volatile Alkali are the Wings with which it flies over with them into the Receiver — It would take up y^e a Lecture to repeat all the encomiums, which Glauber has ascribed to this Salt. —

5ly It dissolves pretty readily in Water producing in its Solution some Cold. If the ▽ stands for

any

(a. 1st By combining the acid & Alkali in separate states —
this is done as before. —

any time, the Salt separates from it, & vegitates (as it is called) or effervesces upon the sides of the glass. If the Water is evaporated a little ye Salt shooties into a kind of loose Plates resembling feathers. —

— As to the Origin of this Salt we shall observe that it is never produced by Nature, but is always an Artificial Substance —

— The Methods of obtaining it are 4 each of which we shall Describe — (a

2nd By combining ye ⊕ with the ☿ in a compound state. This is done by distilling ye ⊕y with Nitrous Ammoniac. — Common Ammoniac, — Spiritus Mindereri & Hepar ♃is made with volatile Alkali — You will readily understand what decompositions take place here, from your knowledge of ye Relation, which the simple Salts bear to each other. — The Nitrous ~~acid~~ ⊕y & ☿ acids & ye ♃ all rise into the Receiver while ye ⊕y from the superiority

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riority of its attraction remains, behind & unites with the ☿. — — — —

3ly We may obtain a Vitriolated Ammoniac by uniting a Volatile Alkali & the ⊕7 in a compound state together. In this case we ~~may~~ take pure Volatile Alkali & add it to the Compounds of ⊕7 with Metals & Earths, & distill them together. The ⊕7 leaves the Metals & Earths, with which it was formerly united, & rises with the Volatile Alkali into the receiver in the form of Vitriolated Ammoniac.

4ly By taking the ⊕7 & ☿ both ~~together~~ in a compound state. This is done by distilling all the Compounds of ⊕7. with Metals & Earths, with Nitrous Ammoniac — Sal ammoniac. Spiritus Mindereri & Hepar 4c. made with Volatile Alkali.

With this we finish our account of ye neutral Salts formed by the Union of ye ☾ & ⊕7. we shall now proceed to ~~that~~ treat of the neutral Salts formed by Alkalis & ye ⊕7 — — — — & first of Cubic

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# Cubic Nitre –

This Salt is compounded of Oy & fossil Alkali. It is called cubic Nitre very improperly, as its Crystals have no Right Angles, & are by no means perfect Cubes. As the effects of Heat & mixture upon this Salt are in most Instances so much like the effects of Heat & mixture upon common Nitre, we shall defer speaking of them till we come to treat of that Salt. –

— We shall only add a few words concerning the manner of its production. –

It is seldom produced by Nature. The Oy is formed by the Putrefaction of Vegetable Substances on the Surface of the Ground. – This Oy descends into the Bowels of ye Earth, where it is generally changed by attracting Bituminous Substances into Oy, so that it is very rare to find it combined with a fossil Alkali – There is however a Place in <u>Virginia</u> where large Lumps of Earth containing

cubic

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cubic Nitre are found in great Plenty. The Oy in this Case probably met with no bituminous matter in its descent into the Earth. to alter its properties.—

— Cubic Nitre is for ye most part an artificial production. The Methods of making this Salt, like the other neutral Salts are 4; of each of which we shall treat particularly. —

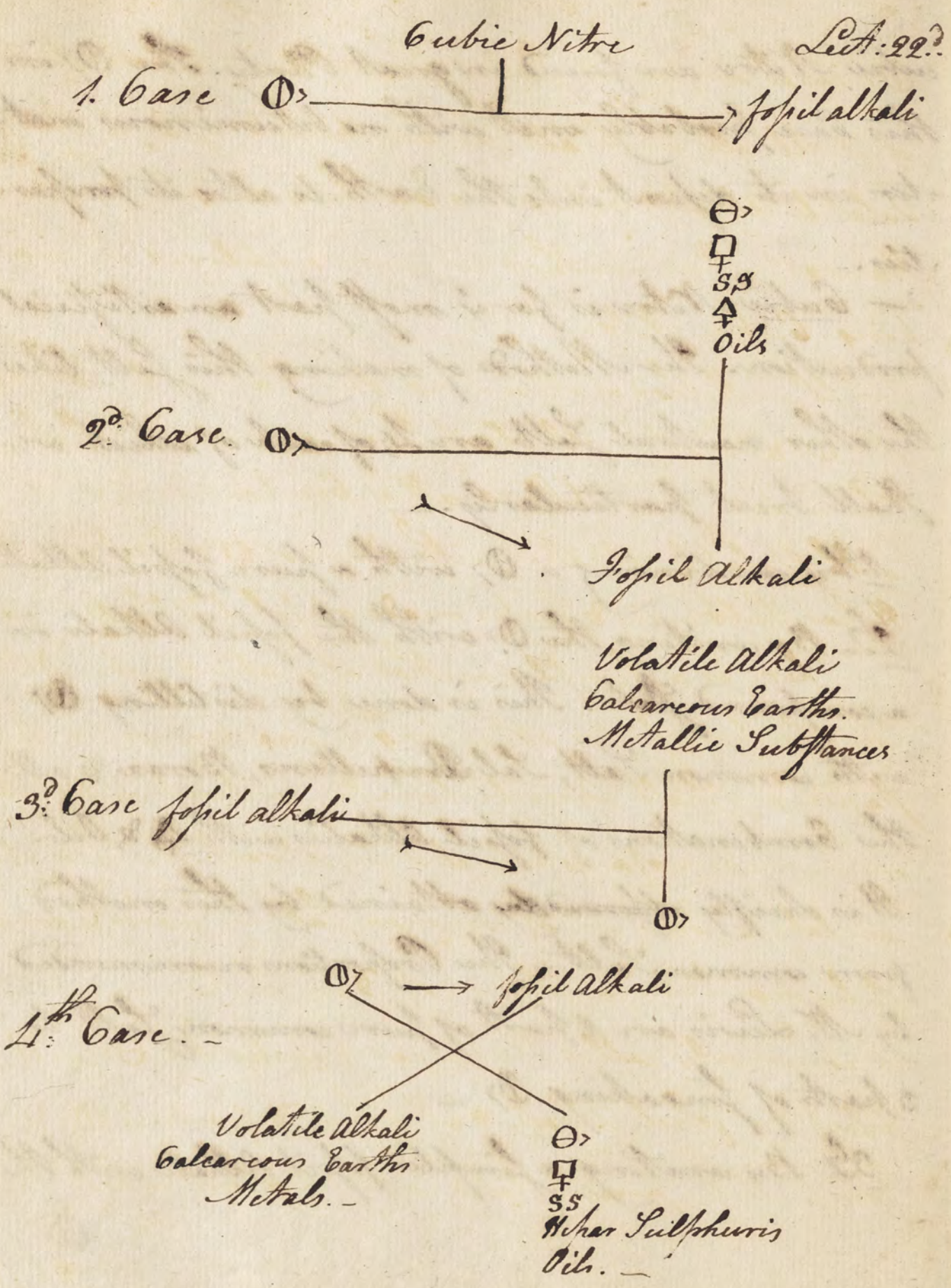
1st by combining a Oy with a pure fossil Alkali

2dly By uniting the Oy with the fossil Alkali in a compound State. This is done by distilling ⊕y with common Salt, Sal Detonellens, Borax & all the Combinations of fossil Alkalies with ♃ & Oils.

It is chiefly ~~obtained by~~ obtained by this method from common Salt — The Proportions recommended by Mr. Lewis are 1. part of pure common Salt to 3 parts of smoaking Oy —

3dly By uniting a simple fossil Alkali with the

Oy


Cubic Nitre
1. Case
fossil alkali
Oils
2d. Case.
Fossil Alkali
Volatile Alkali
Calcareous Earths.
Metallic Substances
3d. Case fossil alkali
4th Case. –
fossil Alkali
Volatile Alkali
Calcareous Earths
Metals. –
Oils. –

Or. in a compound state. This is done by distilling fossil Alkali with all the Compounds of Or, with Volatile Alkali, Calcareous Earths, & metallic substances — This method is never employed in making Cubic Nitre. —

The 4th Method of obtaining this Salt is by taking the Or & the fossil Alkali, both in a compound state. This is done by distilling all ye Compounds of ye Or with Volatile Alkalies, with Or — of ♃ & Sedative with Hepar Sulphuris & Soaps made of fossil Alkali. —

— There is a simple method of making cubic Nitre in the process for obtaining Luna Cornea (a Substance we shall Describe hereafter) without distillation by means of a double elective Attraction. Thus if we take a Solution of common Salt in water & drop it by degrees into a Solution of ☽ in the Or, or what is commonly called the Lunar Caustic, the Or will dissolve the fossil Alkali, & attract ye ☽ from ye Or & both will be precipitated to the Bottom, while the

Or

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Or will unite with the fossil alkali, which the Or deserted. If this Solution is evaporated properly it will shoot into Crystals of Cubic Nitre. There is one inconvenience in preparing Cubic Nitre in this manner, & i.e. if the ☽ contains any ♀, the ♀ will not precipitate with the Or, but will remain united to the Cubic Nitre. It may be known by the blue Color of the Nitre. This is the best Test we are acquainted with for detecting ij presence of ♀ in ☽ — But there is a more easy method of obtaining Cubic Nitre by means of a double Elective Attraction, founded upon ij strong ~~at~~ Attraction which ~~Or has fossil Alkali~~) Or has to calcareous Earths. If to a Solution of Glauber Salt (which you know is compounded of Or & fossil Alkali) you add a well saturated Solution of chalk in Or, the Or will forsake the fossil Alkali, & unite with the Chalk, & both will be precipitated to the bottom in ij form of Selenites, while the Or will unite with ij fossil Alkali which ij Or deserted. If this Solution like the

former

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former is evaporated properly it will likewise shoot into Crystals of Cubic Nitre —

## Of Common Nitre —

This Salt is composed of ♁ & Vegetable Alkali. Its crystals appear of an irregular figure having 6 Sides. They are generally of a very white Color, & are supposed to be most pure when they have the most polished appearance —

## Effects of Heat —

It melts in less than a red Heat. It becomes volatile when the heat is rendered most intense, & parts with its acid. The fusion of this Salt is not owing to the water it contains, but depends upon the same Cause as the Fusion of Metals. It is probably owing to the presence of Δ —

## Effects of Mixture —

~~It melts in less than a red Heat. It becomes volatile when the Heat is rendered most intense~~

1st — The ♁ decomposes it, producing with its Alkali a Vitriolated ♃. The other Acids, & the fossil & Volatile alkali have no action upon it. —

2ly

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2ly is much used to promote the Fusion of Earthy Bodies. In these Cases, I would suppose that the acid of the Nitre is dissipated, & that the fusion of the earths is promoted by the simple Vegetable Alkali —

3ly But the chief Property of Nitre is its strong attraction to all such Bodies as contain ♃. If Nitre is melted, & the Heat of it encreased afterwards to a degree of Redness, & a Lump of burning Charcoal added, the coal immediately inflames, & is consumed with a bright vivid Flame sending forth at the same time a Spluttering of Noise. The same Phenomina takes place, if we throw a lump of ♃ into the melted Nitre, with this Difference that less of the Spluttering Noise is heard, & the Flames has a more white appearance. — This White appearance of the Flame was what led the Chemists to suppose that thunder & Lightning were occasioned by ♃ & Nitre meeting together, & exploding in the Air. But our illustrious Countryman Dr. Franklin

has

(a The same change takes place upon the Nitre, if it is mixed with the Coal by what is called Projection — See Newmans Chemistry. —
Dr. Black recommends 1/7 of Coal to 1 part of Nitre —
~~A like~~ A like Deflagration takes place if ♃ is employed — owing to the large Quantity of Δ contained in the ♃ —

has taught us that they depend upon very diffe-
-rent Principles — —

The Splittering Noise we hear when the Coal, & Nitre are mixed together it is called Deflagration. If we examine ye Nitre after it has deflagrated we shall find it changed into a Vegetable Alkali. — Its acid being consumed, & dissipated by its action upon the ♁ of the Coal — Macquaer tells us that a ♃ is produced from this combination of the ☉ with ♁ — But this is far from being the Case, for ye ☉ is entirely dissipated & never unites with ♁ in such a manner as to form any new compounds — When ♃ & Nitre are deflagrated together, & afterwards washed, a Salt is produced from them which is known in our shops by ye Name of Sal Polychrestum. This Salt is composed of ~~equ~~ nearly equal Parts of vitriolated ♃ & Hepar Sulphuris. — For the ☉ being de-

detached

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detatched from ye ♃ unites with Part of the Alka-
-line Basis of the Nitre, & forms a vitriolated ♃, -
while the remainder of ye Alkaline Salt unites
with that part of ye ♃ which was not decomposed,
& thus forms a Hepar Sulphuris — There is another
preparation of Nitre with ♃, which was formerly
much used in our Shops called Sal Prunella —
— This was made by deflagrating ye Nitre with
a small Quantity of ♃. The ♃ was used in order to
dissipate the Impurities from the Nitre. — But
Solution & Crystalization will answer ~~[illegible]~~ much
better for this purpose. — This Deflagration is
a very important Property in Nitre, as it serves
to shew us the Presence of Δ in those Bodies, which
are mixed with it. — We must remark here that
Nitre never acts upon Inflammable Substances
unless either the Nitre — or the Inflammable Body,
& sometimes both are red Hot — This depends either
upon

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upon the ☉ adhering so closely to its Alkaline Basis, that it cannot be seperated without a red ~~Heat~~ heat, or upon the Δ not acting till it becomes red hot. Nitre is the basis of all exploding Combinations.

Gun Powder is made of Nitre — ♃ & charcoal — As this is an article, which has (strictly speaking) made the most noise in the World, of any thing the Chemists ever invented, we shall stop to say a few things concerning the composition of it. It is certainly a useful invention. Wars have been less frequent & less Bloody since the introduction of Gun Powder &c. than formerly. The Chance of War becomes more equal, where the Strong derives no advantage from their Strength — & the weak suffer nothing from their weakness. Besides it is computed that not more than 1/10 of ye Number are slain by Fire Arms, as were formerly with other Weapons, & that only one ball in 20 does any Execution at ye ordinary Distance Soldiers fire —

1st —

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1st The Nitre we employ should be as pure as possible. In the Manner of refining this Salt a quantity of common Salt & calcareous Matters often adhere to it. These should be carefully seperated from the Nitre, by methods we shall describe hereafter, for they would soon spoil ye whole Gun powder, upon the account of their strong attraction of ye moisture of ye Air. —

2ly The Charcoal is generally made from the light-est Woods. we find most of authors, who speak of Gun Powder recommend this kind of Charcoal, but Mr. Baume, an ingenious Chemist at Paris, has showed us that Charcoal made from ye solid Woods an-swers equally well in all Cases. We shall show here-after that all charcoal contains a quantity of fixed air in it. Its Usefulness in making Gun Powder depends upon this Quality in it. Now Coals made from all kinds of wood contains an equal Quantity of this fixed Air provided they are made proper-ly —

3ly

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3ly We have little to say of the preparation of ♃. It is necessary it should be as pure as possible, & entirely free from all foreign Matter of every kind —

— That Gun Powder is said to be good, which has the 2 following properties — 1st It should kindle the moment it comes in contact with the Fire, & 2ly It should have little or no recrementitious matters behind it. The 1st of these will depend much upon the proportions of the Ingredients we employ. These are different in different Countries. After many experiments made by Mr. Baume upon this Subject, he found that 75 parts of Nitre, — 15 pts ½ of Charcoal, & 9 pts & ½ of ♃ answered best. It is necessary they should be mixed entirely together, as the Nitre never inflames till it comes immediately in contact with Inflammable matter. The 2d Property we spoke of depends upon

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upon the purity of the Ingredients, & their intimate union with each other. —

— The mixture of the Ingredients is generally made in a wooden Mortar, by means of a wooden Pestle. In large Works a mill of a particular structure is employed which answers the same purpose. Great care should to moisten them well now & then, to prevent their finer particles from being dissipated, as also to prevent their taking fire from the heat generated by the action of the Instrument we employ to mix them. —

— When this Operation is finished, which generally takes up 12 hours — the whole is carried out & exposed to the Sun to Dry. Some use Stoves for this purpose, but they are always dangerous upon the account of our not being able at all times to regulate their Degrees of Heat. — When this Mass is thoroughly dry it then becomes Gun Powder. It is now in its most perfect State. It catches Fire in this State much

quicker

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quicker than it ever does afterwards. This Depends upon a principle we before Spoke of when we explained the Laws of ye Communication of Heat — The Smaller Bodies are of a similar Form, the greater Surfaces they have to be acted upon. — The Powder, therefore in this State, is soonest acted upon by fire, & its Parts touch in a more favourable manner to explode quickly, than they do after it is made into Grains. However it will by no means do to keep it in this form. Its Attraction to moisture while in this State is so great, that it could not be kept any time. Besides this it blackens every thing it touches in such a manner, & Sticks so much to the Sides of ye fire Arms when thrown into them that it is necessary it should undergo another Process which is called Graining

This Operation is performed by means of a Leather Sieve, filled with holes as large, as we would wish to make the Grains of the Powder. The Pow-

der

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-der is then thrown into it, & a large piece of flat Wood is placed over it, which fills near ½ of the Sieve. It is then shaken very well till the whole of ye powder falls below in the form we see it. It is now fit for use, & is employed chiefly in Canons & the larger fire Arms. —

— But there is a finer kind of Powder sold in our Shops, by the name of Glazed Powder. This is made by filling a Barrel or Hogshead, half full of the above grained powder, & turning it for 6 Hours pretty constantly upon two Points — The Grains of Powder by striking against each other give them that beautiful polish we observe in them — This is chiefly used for Hunting Sports & ye like — It is seldom so good as the unglazed Powder — It remains now that we enquire upon what the Expsion of Gun-Powder depends. This is indeed a wonderful Property in matter — so much so, that we may not only believe Travellers, when they tell us, that the natives of uncivilized Countries fell down & worshipped their fire Arms, as

ye

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if they were little Deities, but we may almost forgive them their Ignorance & Credulity. —

— I shall not take up your time in repeating the Theories of Beerhaave, Macquair & others upon this Subject, but shall deliver one to you, that is more simple & better Supported than any that has yet been proposed. — Charcoal, we said before contains a great quantity of fixed Air in it, which Seperates from it, during its Inflammation. Nitre we know determines every body that is in the least Inflammable, & that can Support a red heat, to a rapid & Sudden Inflammation. — In the Case of Gun Powder the ingredients are so intimately mixed with each other, that every Particle of Charcoal is Surrounded with or contiguous to Some Particles of Nitre. As Soon therefore as any one particle is kindled, immediately the Inflammation of the whole Mass Succeeds at the Same Instant. By which means the Air which was contained in the Charcoal in a fixed

or

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or non elastic State, is restored to its elasticity & thus occasions the explosion we hear.

— Hepar Sulphuris, which is composed of fixed Alkali & Brimstone united together by means of heat, has exactly the same Smell as the washings of a Gun; this Smell in both cases depends upon the same principles — After the Explosion of the Gun powder, the Brimstone which was unconsumed by ye Inflammation unites with the Alkaline Basis of the Nitre, which was decomposed by the Inflammation & thus forms a Genuine Hepar Sulphuris. No wonder therefore their Smells are the same —

— That Gun Powder, is therefore the best, which leaves least of this kind of Smell behind it, as it shows that all the ♃ has been consumed by the Inflammation. —

— The Pulvis Fulminans is another exploding powder formed by a Combination of 3 parts of ♃ — 2 parts Nitre & one of Salt of ♃ — It differs from

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from Gun Powder, in exploding without being confined - This depends upon its component Parts being more intimately mixed together, so that every Particle of it takes Fire at once, & not gradually as the Parts of Gun Powder do, The fixed Air which occasions the Explosion is contained in the Alkaline Salt. -

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# Lecture 23d. —

Having finished our account of the Relation of Nitre to Inflammable Bodies, we go on to treat of its Relation to the other Objects of Chemistry —

1ly It promotes the Fusion of Ores, but in this, as in the Case of the Earths, I believe the Acid is dissipated from the Nitre. While the Alkaline Basis alone, acts in promoting ye Fusion of the Metals. —

— When it is mixed with any of ye metals in powder, particularly with Zink or ♁, & exposed to a red heat, it deflagrates violently carrying away with it Δ of the Metal. This as we shall say hereafter is one of the Proofs of the Presence of Δ in Metals —

— The great Power which Nitre possesses of Vitrifying & dissolving metallic matters is the Foundation of its being used to seperate the baser metals from ☉, as we shall say hereafter, when we come to treat of that noble Metal. — See Lewis Com: p: 69.

4ly Its fertilizing Power in promoting the growth of

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of Vegetables has led ~~many~~ several Chemists to suppose that it has the same power in acting upon what they call the Seed or Vivifying principle of Metals. — This Principle they take to be O; which they say is present as if life or Soul of all Metals. The Art of Alchemy consists in nothing else, but the encreasing, or extracting this principle from the Baser Metal. It is said to encrease it most in Copper; hence we find Basil a German Chemist, who was strongly tinctured with Alchemical Notions, introduces Nature as speaking for itself in the following pompous Language. —

" He that intends my death, need be a prudent
" Man, so that he may expell my Soul from me. —
" When this is done I venture upon all the things
" I am able to do, but I can do nothing whilst in
" my ~~active~~ single State. I therefore take Venus (which
" is the ancient name of Copper) who is a chear-
full

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"full Woman to be my Wife. By my union with
"her, I expell all defilements from her, & am my=
"self purified thereby, so that in a little time we
"beget, & leave behind us rich Children, who enjoy
"the fruits of our mutual Labors." I need not take
any pains to shew the weakness or absurdity of
these Alchi~~mical~~mical Opinions, ~~or~~ & experiments, I shall
mention them more fully when we come to ye
Metals. —

5th Nitre dissolves readily in Water. It requires
near 7 times its weight of water for this purpose —
6ly Its action upon vegetable Substances is no ways
remarkable. Its effects upon Animal Substances are
more remarkable. It is much used in preserving
Flesh from Putrefaction. It gives it a beautiful red
colour. — But of this we shall say more hereafter
when we come to treat of the Absolute & Relative
Powers of the neutral Salts in resisting putrefaction,
under ye Head of Antiseptics. When I shall lay before
you

you some new & useful Experiments, which have
been made in France upon this Subject. —
— It remains now that we treat of ye Natural
History of Nitre. —
— It has long been an Opinion among Chemists &
natural Historians, that Nitre is a natural production.
In Persia — India & China we are told, that it is
found in large Quantities. It is ~~[illegible]~~ lodged, they
Say, in a loose friable Earth on the Sides of Hills —
But this account of the origine of Salt Petre, begins
now to be looked upon as fabulous. — It is seldom, I
bleive, produced by Nature, but is always the product
of Animal or Vegetable putrefaction. — The Ground,
which is penetrated by the Roots of Plants, may con-
tain some in it, but as for those cold Beds of Nitre,
which some Traveller speak off, we have now good Rea-
son to think there is no Foundation for them. At
Patna a large City in India, we are sure, from some
late accounts, vast Quantities of Salt Petre are made
from the offals of the Soon. We are indeed furnished
with

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with a particular account of the method they use in making their Nitre. I would not have you understand from this, that it is never found in a native State. It is often found adhering to large Rocks. It was from this, that it first derived the Name of Salt Petre — or the Salt Stone — Petre being derived from the Greek Word Πέτρον which signifies a Stone. It is likewise found in a native State under the Arches of large Bridges, & sometimes in Vaults or wine Cellers, as also in some Plants. But it is in such small Quantities here, that we are seldom at ye Pains of collecting it. — The Manufactory of Salt Petre, is now no longer confined to the East Indies. It is made in many Parts of Europe — Cramner, a German Chemist, of considerable note, tells us, that it is made in some Parts of Germany in the following manner. He orders Lime, Rubbish — Garden mould — & ashes to be mixed together, & moistened from time to time with Urine, Care being taken to stir them frequently. They should all be put into a small house well covered, with a Window towards ye North-East

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North-East. It is not, as some have supposed, that we are directed to leave this house open towards the North East, because the Nitrous Particles are brot from that Quarter — It is because the north east winds are generally accompanied with the Temperature of ye Air, which is most agreable to the Formation of the Nitre. — In a month or two this Mass will be impregnated with Nitre so much that ℔j of it will contain ℥ij of it. — It is when obtained in this manner mostly combined with a Quantity of common Salt. — In what manner this is to be seperated we shall say hereafter. —

— There is another method made use of in Germany for obtaining Salt Petre, much more simple than the one described by Cramer — The German Princes, sensible how important the manufactory of this Article is to their Countries, order the Farmers by Law, to build all their fences of Earth mixed with Straw or during — These Substances corrupt in the Course of a few Years. The Fences are then taken down, & are made to yeild the

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the Nitre in considerable Quantities. This method is followed particularly by the King of Prusia —

— In the Electorate of Hanover, Salt petre is prepared from the Sweepings of a little Town. Dr. Franklin informed me that an Old Man & his Wife, made as much Nitre in this manner, as supplied the whole Electorate — The Salt is procured from these Sweepings, in the ~~Great~~ same manner, as from other Materials in other Countries. —

— In France Salt petre is produced Accidentally — The Rubbish of old lime-Buildings — Pidgeon Houses — Stables or indeed any other putrid Mass of Matter, which has been long covered, is mixed with a Quantity of lime & thrown into water — The Salt which it contains is soon dissolved in the water & is afterwards boiled down & Crystalized. — The Nitre in this State is very impure, & contains a great Quantity of common Salt mixed with it. In what manner is this common Salt to be seperated? Before we answer this Question, we must premise, that bare evaporation will

crystallize

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crystalize common Salt, but that Cold & Rest are ne-
cessary to crystallize Nitre. The Ley (if I may so
call it) made from ye materials, which yeild Nitre is
put into a large Vessel & is gradually boild away, till
Crystals of common Salt ~~beg~~ begin to form in it. These are ta-
ken out as fast as they form, & thrown * Into Vessels, which
stand over the One in which ye Liquor is boiling - When
no more Crystals of common Salt can be found, the liquor
is taken off, & emptied into a number of Earthen or Cop-
per Pans, in which it soon shoots into Crystals of Salt
Petre. This is the 1st Degree of Purification. As a
Quantity of common Salt adheres to these Crystals, it
is necessary to dissolve them a 2d time, in the manner
we said before. A much less Quantity of common Salt
is obtained now than formerly. The Nitre in this State is
used chiefly for ye purposes of Medicine & ye like. - But
there is a third degree of putrefaction necessary, ~~before~~
~~all the common Salt is completely necessary~~ before all
the common Salt is completely seperated from it. It is
chiefly.

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chiefly used in this State for Gun Powder, which we said in our last lecture required ye purest Nitre. — The Liquor which would not Crystalize is used for making Magnesia — But of this hereafter. —

— Besides these methods of preparing Nitre — Glauber has pointed out several others, equally cheap with those we have mentioned. I shall beg leave to read you one of them, which Mr. Le Roux of Paris assured me, he had succeeded admirably in many Trials. — — See Glauber Chemistry p. —

— But there is another method of Obtaining Nitre from common Salt mentioned by Glauber. In this Case the common Salt undergoes a real Transmutation. — a strong proof this of there being but one primogenial Acid & Alkali. — Common Salt contributes towards fertilizing ye Earth, in no other way than by being changed into Nitre — hence we find that Ground, which has been manured by common Salt, yields more Grass or Grain the 2d or 3d Year after it

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it has laid on the Earth, than it does the first — for it generally requires that time to complete ye transmutation of the common Salt. —

— Nitre Besides being obtained in this manner is often found in a native State in certain Plants — The Tobacco leaves in particular abound with it, & hence we find they sparkle when they were dipped in a Solution of Nitre & afterwards dried. There are several Plants besides tobacco, which contains Nitre — To know when a Plant contains any of this Salt, bruize it well & put ye Juice into a Cool Place to crystallize — In order to prevent its growing mouldy, throw a little Oil upon ye Surface of it. If the Plant contained any Nitre, you will find it in Crystalls by the Side of ye Vessel in 6 weeks or 2 Months. If you should find no Salt Petre, you will probably find common Salt or vitriolated ℞ or perhaps a Glauber Salt. —

— In what manner is the nitre formed? We

are

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are much in the Dark with Regard to the part, Nature employs in making it. Is it composed of ye primogenial Acid, combined with an Alkaline Salt, & a Quantity of putrefied Animal or Vegetable Matter? This is Dr. Stahls Opinion. — We spoke of it before. Does it float in the Air? no it does not — We have no proofs of nitrous particles being found in the Air. It appears to be formed agreable to Dr. Stahls opinion, by the evolution of certain principles from putrefying Vegetable, & Animal Substances, which lie upon ye Surface of ye Earth — This is the only use of it in all those matters from which we obtain the Salt Peter. —

— The Artificial Methods of obtaining nitre are 4. —

1st — By mixing the ☽ with the Vegetable Alkali.

2d — By mixing ye ☽ with the Vegetable Alkali in a compound State. This is done by distilling the ☽ with digestive Salt — Regenerated ♃ — Soluble ♃ — Soap

and

and Hepar 4ris

3de By mixing the Vegetable alkali, with the Oz in a compound state. This is done by distilling the Vegetable alkali, with the Nitrous Ammoniac. or by adding it to any of the Solutions of the Earths or metals in ij Oz.–

4ly By mixing the nitrous acid & ij Vegetable alkali in a compound state together, this is done by distilling all the Combinations of the Oz, with Earths. & metals with Digestive Salts,– Regenerated & soluble ♃,– with Soap & Hepar Sulphuris.

With this we finish our account of Nitre.–

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# Lecture 24th

## Of the Nitrous Ammoniac

This Salt is composed of O & ye Volatile Alkali — It is seldom obtained in a Crystalized Form — When exposed to ye Air it undergoes a Dilaquescence — By Heat it easily converted into Vapor — when it is thrown into the Fire, it undergoes an Inflammation, with something like a Detonation. This depends as we said in a former Lecture upon the Presence of the A in the Volatile Alkali —

### Effects of Mixture.

1st It is decomposed by the O & by both the fixed alkalis —

2dly It has no remarkable Action upon Earths —

3dly It dissolves intimately in V — Its effects upon the other inflammable Matters are no ways remarkable —

4dly Its effects upon the Metals are nearly ye same as those of the Vitriolated Ammoniac —

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It dissolves readily in Water, & has 6: no uncommon Action upon Vegetable or Animal Substances. —
— It is Altogether an Artificial production —
The Methods of making it are 2 — you easily find out what they are from recollecting the ~~method~~ manner in which the other neutral Salts were made — Mutatis mutandis. —

## Of Common Salt. —

This Salt is composed of the ⊖ & the fossil Alkali —
Its Crystals are very irregular, Unless the Salt is obtained by a slow Evaporation —
— When it is thrown into ye Fire, it decripitates with a considerable Noise — This Decripitation is said to be peculiar to common Salt, but we find in vitriolated ☿ & several other neutral Salts — It suffers no change in its properties by the effects of Fire when the Salt is pure. —

### Effects of Mixture.

1.st — It may be decomposed by ye ⊖ & ⊖ — 2ly.

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2ly It acts upon some, & has a strong attraction to other of the Earthy Bodies. If a Quantity of common Salt is thrown into the fire, & an earthen Vessel held over — the outside of the Vessel will be Vitrified or glazed. — But of this we shall speak hereafter. It is sometimes found combined with a quantity of Magnesia or Calcarious Earth. The presence of either of these matters may be known, by adding a Solution of any Alkaline Salt, to a Solution of common Salt in water — The Alkaline from its superior attraction to ☉ with which the Earth was combined, unites with it, & forms a common or digestive Salt, according to ye Nature of ye Alkali we employ. The Earths in the mean time are precipitated to the Bottom. If the Earthy matter which adhered to ye common Salt, was magnesia — the precipitate will of course be nothing else but a magnesia. It is in this manner this useful absorbent powder is often obtained, as we shall say hereafter —

— Sometimes we find the ☉ united with Magnesia

forming

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forming what is called Epsom Salt, closely combined with common Salt. In order to seperate it we must have recourse to a double Elective attraction, the principles of which we expounded formerly. To a Solution of this impure common Salt, we must add a saturated Solution of Chalk ~~&~~ in the ~~Solution~~ ⊕ — The ⊕ from its superior attraction to the Chalk (as you will see in y Table) readily unites with it, & leaves the Magnesia for the ⊕ to unite ~~with~~ it. The new Compound of ⊕ & Chalk falls to Bottom & is insoluble. The Compound of ⊕ & magnesia may be seperated with little difficulty by Crystalization — But there is a method of ~~seper~~ seperating this Epsom Salt, from common Salt, without communicating any foreign Impregnation to the Liquor. It consists in adding to a Solution of common Salt some strong Lime Water. The ⊕ here forsakes the Magnesia, & is precipitated with the Lime. The Magnesia having nothing to unite with, falls to the bottom with the Selenitic Compound. This Method is not so good as the former one, since limewater

will

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will sometimes produce a turbidness & precipitation in many Liquors, which contain no Oz. —
— Most of the common Salt, which we use contains a Quantity of these Earthy matters mixed with it, & on this depends its strong tendency to deliquesce in the open Air. When this Salt liquifies in this manner, the foreign Matters may easily be seperated from it by Crystalization — There is another Fact which we here explain (i.e.) why common Salt, which has been melted in the Fire, deliquesces so speedily in the Air, Whereas before it was melted, it shewed but little Tendency to grow moist. This we supposed to be occasioned by the Salts parting with some of its acid in ye fire, so as to partake afterwards of an Alkaline Nature — for all Alkalies we know absorb Moisture from ye Air — But we shall find that it depends upon another Cause. The common Salt, however pure it may appear contains a Quantity of Oz, united to magnesia, in it, when it deliquesces in this manner —

and

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and an Exchange of acids or a case of double elective attraction takes place, by their being melted together. The ⊕ being loosened from the Magnesia by means of ye heat, decomposes the common Salt, & unites with its Alkali, while the ⊖ unites with the Magnesia & forms with it (not a crystalized Salt, like that composed of ⊕ & magnesia) but a Salt remarkably deliquescent. The Sal Ammoniacum fixum may be formed in this manner. The most remarkable property of this Salt, you may remember was its strong attraction to the moisture of the Air. I will not pretend to say that Common Salt never parts with any of its acid by heat. When it is hastily boiled down, or when the Dry Salt has been exposed to a strong Fire, it may part with some of it. But in this Case I believe that common Salt is always impure. Mr. Baume in his Manuel de Chemie, has shewn us, that pure common Salt, will not ~~exact~~ suffer a Decomposition by the ordinary Heat, which is supposed to occasion it. Thus have we pointed out under the Relation of common Salt ~~the~~ to the Earths ye best method

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method of purifying common Salt. — You ~~the~~ are all acquainted with the effects of common Salt upon Earth as a manure. — We shall ~~first~~ treat more particularly of this, when we come to deliver ye Elements of Agriculture —

2ly Common Salt has but a slender attraction to Inflammable Substances — It cannot be decomposed like cubic or common Nitre by deflagrating with charcoal, upon the account of its slender attraction to ☽. When we want to obtain its alkali, we are obliged to form a Glauber Salt, or cubic Nitre by distilling it with ⊕ or ⊕». — These you know deflagrate easily with Charcoal, & leaves a pure fossil Alkali behind —

— Common Salt dissolves particularly in ♈ — If this ♈ is heated a little, & afterwards set on fire, the blaze has a pale blue Appearance. If a human Face is viewed thro' this flame, it makes a most frightful Figure, somewhat resembling that appearance, which the Face of a Corpse, has, two Days after its Death, or in its first stage of Putrefaction. —

4ly

4ly It has no great action upon any of the Metals in this simple state. If it is added to a solution of ☽ in ☉ or ~~with~~ what is called Lunar Caustic, a double Elective attraction takes place. The ☉ unites with the ☽ & falls to the Bottom, forming a horny kind of Substance, hence called Luna Cornea – The fossil Alkali of ye common salt, unites with the ☉ forming a Cubic Nitre – –

Common Salt is sometimes used to promote ye Fusion of Ores. It is ye alkali alone which acts in these Cases. The ☽ is dissipated by the Intensity of ye Heat –

5ly Common Salt dissolves readily in 4 times its Weight of Water. There is a Circumstance attending the solution of this Salt which is peculiar to it, & (ie) it dissolves as easily in cold as in warm Water. –

6ly Its Action upon Vegetables is not remarkable – As to its Effects upon Animal Bodies, we shall treat of them at large when we come to treat of Antiseptics –

– It remains now that we speak of the natural History of common Salt – And here we may begin by remarking

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marking what the Poet says of Jupiter with a little variations, he said of common Salt. "Omnia plena sunt Salis." It seems as if every part of Nature was liable to dissolution, & that her beautiful Author had distributed this Salt in order to prevent it. — It is found in ye 1st place in larger Quantities in many places in the Bowels of the Earth. The Rock Salt (as it is called) is found in Poland, Hungary & ye East-Indies. It is a hard transparent Mass — has a brown Color, & has some resemblance to Gems, upon which account it is called Sal-gem. — At Cracow in Poland, there is a Stratum of this Salt, which is so immense, that it has been computed there is Salt enough there to last the World a thousand Years. — The Island of Ormus at the Mouth of ye Gulph of Persia is composed of nothing but Salt, in so much that the Inhabitants are obliged to build their houses of —

2ly It is found in Springs in many parts of the World — There are few Springs of Water so pure, but what contain a small portion of it mixed & scattered

with

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with other matters. Salts obtained from these Springs is called Fountain Salt. — But —

3ly It is found in the greatest Quantity in ye Ocean — Many Disputes have been carried on among Philosophers, to determine whether it has acquired its Saltness from rolling over Beds of Salt upon the Bottom of the Sea, or the Bowels of the Earth — This last opinion has prevailed so much that some have endeavoured to find out the Age of the World by first finding how much Saltness the Sea acquires in a giving time & so calculating backwards till they come to ye time in which they supposed the Water had no Saltness. I cannot assent to this Opinion — on the contrary I am inclined to believe that the water was formed Originally in the State we Observe it at present, & that too, for very wise purposes — If it derived its Saltness from Subterraneous Beds of Salt, the Streams which we so frequently meet with, in digging into the Earth, would sometimes be impregnated with it; But instead of this, we always

find

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find these Streams of Water very fresh. Nor do we find the bottom of the Ocean covered with beds of Salt as we might expect if the water derived its Saltness from it. But on the contrary we find it always covered with Sand. — This the Sailors are witnesses of, who generally anoint the End of the Lead, with which they Sound, ~~the Sea~~ with a little Tallow — and if it reaches Bottom, they never fail to find it covered with either mud or Sand, without the least mixture of Salt. —

— The Sea is always found most impregnated with Salt near the Equator or within ij Tropics — It is however so agitated by Storms & Tides, that the weaker & stronger parts are generally mixed in some measure together — There is however an Essential Difference in ij degrees of Saltness of the Water in different parts of the Ocean. Mr. Boyle found that ℔ij of Salt water contained only ℥ss of Salt in the Baltic, whereas ℔ij of it immediately under the Equator contained ℥ij of Salt. —

This may easily be accounted for when we consider how much greater the Heat is, & of Consequence the Evaporation

tion are, between the Tropics, than nearer the Poles, & this we know tends to concentrate the Water, or to encrease its Saltness, for its is its fresh Parts only which are evaporated. Add to this, that the Quantity of Rain & Snow, which are poured in such great Quantities into the Northern & Southern Oceans, tend to dilute it in such a manner as to lessen its Strength. — Salt water in a general Way is to fresh Water as 73 is to 70. This Difference, altho' so inconsiderable, makes a great odds, in its Density, hence we find that all Animals swim, & that Ships float with much less Difficulty in Salt water, than they do in fresh. — The Saltness of the Sea water is not only the Means of preserving itself from putrefaction, to which it would be very liable, considering how many heterogeneous matters of a Vegetable & Animal Origin it contains, but it likewise serves to preserve the numerous Tribes of Fishes, which inhabit it, from putrefaction. This Antiseptic Power of Salt Water, is not confined to Fishes alone; it extends to other Animals, particularly to the

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the human Species. It has lately been found that Washing the Body every Day in Salt water, has prevented Sailors & others from being seized with the putrid diseases of the Warm Climates. Mr. Moses Bartram of this City, informs me that he lay 3 Months exposed upon the Deck of a Ship, in a harbour of the Island of Jamaica, without receiving any Damage, which he attributes to his following this Practice. He remarked that he never awoke in the Morning without finding his Shirt all over wet with the Dew, that had fallen in the Night. — Three Persons died of the Yellow Fever in a Ship, which lay next to him. — The Crew having neglected to bath in the Salt Water, & so careful were they to avoid ye Evening Dew, that none of them ever ventured upon Deck after Sun Set. In those Countries where People are far removed from the Sea, A Bath made of a Quantity of Salt dissolved in Water, has been found to answer equally well. Nor need we be surprised at this when we recollect that in some parts

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of the World particularly at a place called Gambroon on the Island of Ormus in the Persian Gulph. It is common for the Inhabitants to lie upon Carpets in open Balconies – or upon the Tops of their Houses, without ever receiving a Cold or other Disorder. – The Dew which falls in this Country, instead of bringing on Diseases rather prevents them, for it is strongly impregnated with the Natrum or fossil Alkali, which abounds much on the Surface of the Ground in the Neighbourhood of that Island, particularly in Egypt. This fossil Alkali was much used by the Ancients in their Baths, & was found to be very salutary – Its Antiseptic Virtues are nearly the same according to Sr John Pringle with those of common Salt. –

– Having mentioned this Fact I cannot help adding here a few other Directions how to prevent the Contagion of putrid Diseases. –

– 1st Gun Powder has been found very powerful in putting a Stop to the Spreading of putrid Disorders. Whether it acts by the Shock it gives the Air in ~~at the~~ Instant

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Instant of its Explosion, or whether the Ingredients, which compose it, enter into Mixture with the putrid Miasmata, which float in the Air & so destroy them, I cannot pretend to say. The last appears to be the most probable. During the late War, a putrid fever some what resembling the Gaol fever broke out in a Ship belonging to Admiral Hawkes Fleet. It happened in the midst of this, while the Men were dying in great Numbers every Day, that this Ship was engaged in a Sea fight — The Day after this Engagement all the hands on board began to recover, & an entire stop was put to the spreading of the Fever — This sudden Alteration was justly attributed to the Gunpowder, which had been discharged the Day before. —

— 2ly Avoid the Evening & morning Air as much as possible, & by no means ever venture out in ye morning with an empty Stomach. It is a common practice with some to take a Drachm before they go out — A crust of Bread or a Biscuit is much better.

Those

Those who suppose that Contagion is received with the Saliva, & passes with it into the Stomach, imagine that the use of these things is to prevent this — But I would rather suppose, they obviate Contagion by strengthening & bracing up the Stomach, by which means a proper Tension, or State of Resistance, is given to the whole System, with which, we now know the Stomach to be wonderfully connected. —

3ly Avoid Intemperance on the one Hand & too great abstinence on the other — Should we enquire who they are, who are most obnoxious to putrid Diseases in ye West Indies — we shall find that those good Yeomen (as the Poet calls them) whose Limbs were made in England; who cannot live without good Beef & Porter — & the Caledonian, who restricts himself to Barley Broth, are most frequently attacked with putrid Fevers. We should avoid these two extremes. They both produce that State of Irritability & atonia in ye System which are very favourable to ye action of Contagion —

4ly

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4ly As Miasmata act primarily upon the Nervous System, we should endeavour to keep some impression upon it, which shall render the Body insensible to the Stimulus of Contagion. — Dr. Sydenham tells us, that Gouty People escaped the Plague. This was owing to ye Stimulus of the pain of the Gout, being greater than that of the Plague. We read in the history of the same terrible disorder of a Sexton, who buried all those who died of the Plague in one of the largest parishes ~~of~~ in London, & lived 20 years after it. He said his escaping it, was owing to nothing else, but his keeping Garlick or Rue constantly in his Mouth. — The Stimulus of these like that of the Gout, was superior to ye Action of the Miasmata of ye Plague. Instances of like nature might be mentioned without Number. —

5ly Keep those Parts of the Body, which are most exposed to Disorder, covered with some fat or oily Substances. This Caution I grant tends more to ~~contagious than~~ Infectious than contagious Diseases. By infectious Diseases, we understand such, as are propagated by

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by ~~Disease~~ Contact only. By Contagion such as are propagated thro' the Air. It was remarkable in the great Plague which prevailed in London, in y Year 1665, that no tallow Chandler or Soap boiler ever died of it — for the plague, I believe, is an Infectious Disorder. — It is Remarkable likewise, that Hogs are often bit by Rattle Snakes without being the worse for it — The thick fat which abounds in the external parts of their Bodies serving to sheath & destroy the Poison. I have heard from good Authority of fowls being cured of y bite of a Rattlesnake by rubbing the wounded part with a little Oil or tallow. It is a custom with some young men to anoint the End of the Penis with ☿ Oint: ment to secure them from the venerial Disease, when they connect themselves with Women whom they suspect. — I believe sweet oil would answer equally well. The Preventative has never, that I have heard of, failed of y end proposed — We shall not be surprised at these Facts, when we consider how many Analogies Chemistry affords us of the most acrid Substances being

destroyed

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destroyed by being mixed with oil. What can be more acrid than the caustic Alkali, & yet we shall see all its Acrimony destroyed by being combined with oil in the form of Soap - The strongest acids in like manner are weakened & destroyed by uniting with fatty Substances.

But to return —

Having pointed out ij Sources of common Salt, we proceed now to treat of the methods of seperating it from these foreign Matters, with which it is combined —

The Methods employed for this purpose are four, Of each of which we shall treat in order in our next Lecture. —

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Before we proceed to treat of the 4 methods used to separate common Salt from those foreign matters with which it is combined, we must remark that we must consider all the Salts as in a fluid form, or suspended in Water - for the first thing we do with Sal Gem: is to dissolve it in water, before we attempt to purifie it.

The 1st. Method, for obtaining common Salt from the Water in which it is dissolved, is by Congelation - This is sometimes used in the Northern Parts of Germany. -

The Salt water is exposed to the most intense Cold, by which means its fresh Parts only are frozen, while ye Salt is precipitated to the Bottom in a solid form -

2ly Common Salt is obtained by the ordinary heat of the Sun, evaporating the Water from the Salt in those Places, where it naturally or artificially flows in upon the Land. This is the case in a more particular manner in Holland - France, & some Parts of Hungary. -

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Hungary. — But it is found in the greatest quan:
:tities, in the low lands in South America & on the Cape
Verd Islands. In these Islands the Inhabitants dig a
number of shallow Ponds in their Plains, by which means
more salt water is detained, & more salt formed from it.
The Trade of these Islanders consists chiefly in exporting
the Salt prepared in this manner — A Method somewhat
resembling this is followed in Italy — France & some
parts of Germany — In France they make as much
Salt by this method a little varied, in 2 weeks, as will
supply the Kingdom for a whole Year — It is all brought
up by the King, & sold by his farmers general to his Sub:
:jects at an immense price, considering ye little Expence
with which it is prepared. The Revenue from this single
Article to ye French Crown is not much less than a Million
a year. The Salt obtained in this Manner is called Bay
Salt. —

— A 3d — Method of ~~procureting~~ procuring common Salt
from Water, is by waporating the water by means of
Fire.

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Fire – This is practised only in those Countries where Fuel is plenty. All the common Salt made use of in England & Scotland is obtained in this manner. The Salt Houses are built near the Sea Shore, & are all provided with a large pond, into which the Salt water flows, & stands long enough to deposit some of its impurities – After this it is put into a large pan, under this pan there is a Cavity for the fuel. around this pan there is a walk – While the Salt water is boiling the Whites of Eggs, or what is more common Ox's Blood, are thrown into it to clarify it. Those substances first mix uniformly with the Salt Water, but as soon as the water comes to its boiling Point, they coagulate & float upon its Surface, first entangling the Dirt which the Salt water contains. This process is called <u>Clarification</u>. – After the water has been sufficiently evaporated, the Salt crystalizes & falls to the Bottom. It is now taken out & put into baskets of a conical Figure thro' which the Water which adhered to it drains away. The Salt obtained in this manner is called <u>boiled Salt</u>. The Same Method is pursued in

purifying

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purifying the Sal gemma. The Salt obtained from Sal: Gem: is called Rock Salt. I need not inform you that nothing but fresh water is evaporated in the purifycation of this Salt. This process suggested to Dr. Lind a Method of procuring fresh Water from Salt by simple Distillation — without the addition of any other Substance. In case of the want of a Still, he found that from a pot 13 Inches in Diameter, by frequently removing the cover, & pouring off ye water collected upon it, ½ of a Pint of fresh water may be procured in an Hour. — The Cover of the Pot should be 5 or 6 Inches from the Surface of the Water. This discovery is one of the greatest Blessings to Mariners that was ever found out, & obviates one of the Calamities they are liable to. — There is however a possible Case, ~~when~~ in which fresh Water cannot be obtained in this manner (i.e.) when there is no fuel to boil the water. Even in this Case, there is a possibility of conveying fresh water into the Body. It is a Custom with some of the European Sailors who trade to the East Indies, where they are pinched for want of Water

to

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to let themselves down into the sea by means of a Rope where they stay till their thirst is fully satisfied. The Knowledge we now have of the Absorbing System of Vessels which are distributed all over the external Surface as well as in the external Cavities of the Bodies, & which are remarkably small, will ~~fully~~ easily convince us how readily fresh Water may be absorbed & conveyed into the Body by this Contrivance — It would be a happy Invention if we could find a method of precipitating the common Salt from the water by means of Mixture. Glauber tells us that the Glacies Maria (a Species of the Talk which we shall describe hereafter) when heated red hot, & thrown into Salt Water, precipitates so much of the Salt, as to lessen the Saltness of the water considerably. This is sufficient to point out there is a possibility of succeeding in this Experiment. It would tend greatly to lessen the risq of long sea Voiages, & it would render many parts of the World habitable & comfortable, where there is so much difficulty in procuring fresh Water —

A 4th Method of Obtaining common Salt is by evaporating

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vaporating the Water by means of an artificial draught of Air. This is practised only in Germany. The Salt Water whether procured from the Sea or from Sal Gem: is pumped up to a considerable Hight & suffered to fall upon 6 or 7 rows of Small Twigs, which break & drive it in such a manner, as to expose it innumerable little Surfaces to the action of the Air, by which means the Water is vaporated & the Salt falls in a Solid form upon the Earth — — You may from this principle understand the final Cause of those Storms which so often raise the Sea into such terrible commotions. — The Animals & Plants, which live upon the Earth, are all supported by water drawn originally from the Ocean — If the Ocean was to constantly in a calm State the Evaporation of fresh Water from it would not be great enough to supply the Exigences of the Earth. — Winds are therefore let loose upon it, Huge Billows are raised, & dashed against each other by which means a much greater Surface of the Water

is

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is exposed to the Action of the Wind, & thus a greater Quan:
tity of it is taken up & carried to the Earth. The Velocity
of ye Wind must be called in likewise to account for ye
rapidity with which the Evaporation is carried on dur:
ing a Storm. — It is pleasing to trace the wisdom &
goodness of ye Deity, in those Operations of Nature, which
appear as if they were occasioned by little of either —
We become convinced in this manner that —
"All Discord" is" Harmony least understood
"All ~~particular Evil~~ partial Evil - universal good".
There are 4 Artificial methods of making Salt —
You may understand what they are by recollecting ye
manner of making the other Neutral Salts —
Mutatis mutandis — It will be useful for
you, to draw out a Table of the Methods of prepa:
ring this Salt in your Notes, or upon a loose piece of
paper. I shall expect to see a copy of it at our
next Lecture. —

Digestive

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## Digestive Salt.—

This Salt is composed of ⊖ > of Vegetable Alkali
The effects of heat & mixture upon this Salt are so inconsiderable, that we
need not be at ye Trouble of dwelling long upon it. It
differs from Common Salt in the form of its Crystals,
& in dissolving more readily in warm than cold water.
This Salt is entirely artificial — The Methods of
making it are D. an account of which please to bring
in at our next Lecture. —

## Of Sal Ammoniac. —

This Salt is composed of ⊖ > & Volatile Alkali. It is
brought to us of a brown dirty Color. — It is concave
on one side & convex on the other. — This depends as
we shall say hereafter upon its manner of preparation.

### Effects of Heat. —

Sal Ammoniac evaporates in a Heat considerably
below its Point of Fusion. It is impossible to decom-
pose it by the mere action of Fire —

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1st This Salt may be decomposed by the ⊖ & ⊕ as also by each of the Alkalies — When ⊖ is employed, a Vitriolated ammoniac is obtained. When we employ ye ⊕ to decompose Sal ammoniac, we must be very careful to confine the fumes which arise from the mixture of those of ye ⊖ & ⊕ together, or mischief will be done to the Operator or Vessel — We must likewise avoid pushing the Heat too much towards the End of ye Distillation or there will be a Danger of the nitrous Ammoniac (which is formed from ye Union of ye ⊕ with the volatile alkali) exploding & breaking the Retort. We took notice of this detonating Quality in this Salt, when we treated of it. Some of the ⊕ rises with the ⊖ in spite of all we can do, & thus forms a kind of Aqua Regia. A pure aqua Fortis may be obtained by dissolving 1. part of Sal Ammoniac in 4 parts of ⊕ — the Volatile Alkali is soon dissipated, & there remains nothing but ye ⊕ & ⊖ mixed together. If we add either of ye

fixed

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fixed alkalies to Sal Ammoniac, the Volatile Alkali is detached, & rises in the Receiver. This Case of Single Elective Attraction takes place in Mixture without Heat. If we add the fossil Alkali we obtain a common Salt. — If the Vegetable Alkali we obtain a digestive Salt. — If 4. Parts of Nitre & 1 of Sal ammoniac are mixed together, & exposed to the Fire a small detonation is produced. — This depends upon the presence of Δ in the Volatile Alkali of the Sal Ammoniac. —

2ly The Calcareous Earths act powerfully upon Sal ammoniac. If we distill them together the Volatile Alkali rises into the Receiver in ye Form of Volatile Salt ammoniac. We pointed out ye Difference in ye quantity in this Volatile Salt which arose from our employing Quicklime or stone Lime in a former lecture, & explained at the same time ye Reasons upon which it depended —

3ly It has but a slender Attraction to most of the

Inflammable

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Inflammable Bodies. It dissolves in ♀ but in such a small Quantity that it requires 32 pts. of ♀ to dissolve 1. part of Sal Ammoniac —

4ly Most of the Metals decompose Sal Ammoniac. ☽, ♀, ♂, ♃. Tin — Lead & ♀ when distilled with it attract the ☉ from it, & suffer the Volatile alkali to rise into the Receiver. If we mix only a small Quantity of these metals with the Sal Ammoniac — The Salt volatilizes, & carries the metals over with it in to the Receiver. If the Metal added was copper ♀ sublimate is called Ens Veneris. — If ♂ It is called Flores martiales — It unites with Corrosive sublimate without decomposing it, producing a Salt called Sal Alembroth. Supposed by the Alchemists to have great Vertues in dissolving Metals — It is somewhat remarkable, that altho' the volatile Alkali is ~~dissolved~~ dislodged from the ☉ by the Metals in Distillation, yet we find that the Volatile Alkali separates them all in a State of Solution without heat —

One

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One Table of single Elective Attraction exposes the Relation of Bodies in the Cold. We shall very often find Instances of its being contradicted, when we call in the action of Fire upon Bodies. —

5ly It dissolves in Water, generating 28° of cold by Farenheits Thermometer. If the Water was heated the Degrees of Cold generated will be much greater upon the account of more speedy Dissolution of the Salt. It attracts ~~some~~ Δ from the Air, hence it deliquesces —

6ly We shall speak hereafter of its ~~at~~ action as an Antiseptic upon Animal Substances. With regard to Vegetables, those Parts of them Viz. their Resins & that part of their Gums which is mixed with resin become readily soluble in Water. How far this heat might be improved towards lessening ye Expence of Varnishes (which are made of Resins dissolved in V) as also towards other valuable purposes we cannot take time to enquire —

It

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It remains now that we take notice of the Origin or Natural History of this Salt. —

— It is very Ancient. Pliny takes notice of it. It derives its name of Ammoniac, from the Temple of Jupiter Ammon, from the Neighbourhood of which it used formerly to be brought. Accordingly to ye Ancients it is a Natural production. But we have some Reason to doubt this, without supposing with some, that the Ancients knew nothing about it, or that they mistook Sal Gem: for it. We might as well suppose that the Chemists who embraced this Opinion, of their being immense Beds of Nitre in the East Indies, formed by Nature, knew Nothing of the properties of Nitre, or, mistook another Salt for it. The Manufactory of ye Sal Ammoniac was probably a secret in those Days — It is but within these few Years that we have found out that it is an artificial Substance — & We are even yet Ignorant of the exact manner with which the manufactory is carried on — We cannot deny but what Sal Ammoniac is

is sometimes found in a Native State. A small Quantity of it has been found in the Neighbourhood of Volcanoes & coal Pits. If we expose Or sometime, to the Breath of Animals, to the Effluvia of putrefying ~~Matters~~ Substances, such as for instance, in Stables, we shall find it changed thro' time into a Sal Ammoniac. But it is formed mostly by art, According to the Account published by the French Academicians, it is made from nothing but soot, & that too of a very particular kind. The Fuel in Egypt (from ~~W~~ whence most of the Sal Ammoniac is brought) consists chiefly of ye Dung of Animals, which has been dried in the Sun. The soot of this fuel is gathered, & put into large Globes of Glass, which were afterwards placed over Furnaces of a particular Construction. — A Gentle Fire is first kindled under them & then gradually encreased till it expels all the humidity & Oil from the soot. There is a small hole left in these Globes, to suffer both these to escape. A Vapour after this Arises from the Soot, & forms a thick Crust upon the

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upon the upper part of the Globe. When the Process is finished, the Fire is put out & the Glass Vessel is broken in order to get out the Salt which it contains. — The Salt is convex above & concave below. The convex part of it is spongy & dirty, while the concave part is compact, & semi-transparent. This depends upon the latter rising by means of a more intense heat than the former. — A Manufactory of Sal Ammoniac, has lately been established in Scotland near Edinburg, & is now in a very flourishing condition. The Sal ammoniac there, is made from any kind of Soot; let it be obtained from what it ~~[illegible]~~ will, it contains one of the Ingredients of ye Salt & ie. ye Volatile Alkali — & Methods of Making it &c. —

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# Lecture 26th — May 27th 1771.—

We come now to treat of those neutral Salts which are formed from a union of the Vegetable Acids with Alkalies. —

## Of Regenerated ♃

This Salt is composed of the acid of Vinegar & ye Vegetable Alk:

## Effects of Heat —

It may be decomposed by the action of fire alone. The ☿ rises into the receiver in so concentrated a state that it is capable afterwards of forming an Other when united with V —

## Effects of ~~Heat~~ Mixture —

1st It may be decomposed by the three mineral acids The Neutral Salt formed will be according to ye acid we employ.

2dly It has no action upon Earthy Bodies —

3ly It dissolves intimately in V. —

4ly It acts but weakly on the Metals —

5ly It dissolves readily in Water — It likewise deliquices in the Air — more than any of the Neutral Salts.

This

This probably depends upon the very feeble attraction which the Vegetable Alkali has to the Vinegar, insomuch that we have reason to suspect ~~that~~ it is rather the Vegetable Alkali, than ye Neutral Salt, which attracts the moisture of the Air. —

6ly We shall hereafter speak of its ~~at~~ action upon Animal Substances — It has no action upon Vegetable Substances —

As to the origin of this Salt it is always artificial — Of the four Methods which are employed to make it, the first is chiefly used ie. the mixing of a Vegetable Alkali with Vinegar. You may see a particular Account of this in Lewis's Edition of the New Dispensatory, & in Macquairs Chemistry: I shall add a remark or two which I believe has escaped the Authors ~~Books~~ of the aforesaid Books & ie. that if the Vegetable Alkali & ÷ are suffered to stand together for several Days after the Effervescence between them has ceased, an earthy matter will be precipitated from the Alkali which will tend to

give

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give the Regenerated ♃ a much whiter appearance — Mr. Beaume (from whom I borrowed this observation) Observes further, that the foliated appearance, which this Salt has, depends entirely on the impurity of the Vegetable Alkali — most frequently on its containing some neutral Salt mixed with it. — When ij Alkali is well purified, no such flakey appearance is perceived in the Regenerated Tartar. — It is called regenerated from the foolish Notion of ij ☿ being changed into a ♃ —

There is a Salt much resembling this in its properties called — The Saline Mixture — or the Antiemetic mixture of Riverius. It is composed of the Vegetable Alkali & the native Acid. Lime or Lemon Juice is generally used for this purpose. Riverius recommends it in the act of effervescence. It is much used to allay a nausea & to stop a Vomiting —

Spiritus Mindereri, or the Vegetable Ammoniac — this Salt is formed of Volatile Alkali & ♃. It is never obtained

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tained in a solid form —

Effects of Heat. —

It evaporates in the same Heat which raises Water. If a gradual heat is applied to it, it becomes thick like a Syrup — The Spiritus Mindereri in this form is very penetrating & has often been used to advantage in dissolving obstinate tumors, & swellings of all kinds in ye Body. —

Effects of Mixture.

It is decomposed by the three mineral acids & ye two fixed Alkalies. — Its relation, 1 to 2 Earths, 3 Inflammables, 4 Metals, 5 waters & 6 ammoniacal & Vegitable Substances, are no ways remarkable. —

Origin —

It is entirely an Artificial Substance being formed from the union of Volatile Alkali & ☿ in their most simple states.

## Sal Rupellens. —

This salt is composed of the acids of ☿ & ye fixed Alkali.

It

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It may be decomposed by means of an Intense Heat — i.e. the acid may be driven from the Alkali. —

Effects of Mixture. —

1. Heavily decomposed by the 3 mineral Acids. —

2d. Its action upon Earths, 3 Inflammables & 4 metals has been but little attended to by the Chemists. —

3. It dissolves readily in Water & acts $\underline{6^{L}}$ feebly upon animal & Vegetable substances — —

As to its Origin it was first found out by Saignett, an Apothecary at Rochelle, after whom it is often called. The Medical Virtues of it were extolled very high for some time — But as soon as the Composition of it was found out it immediately fell into disrepute.

## ♃ Solubile —

This salt is composed of Vegetable Alkali & ij > of ♃

Effects of Heat. —

It is incapable of Fusion. When it is exposed to an intense Heat it is changed into a Coal.

Effects

## Effects of Mixture –

1. It may be decomposed by the three mineral acids as also by the ✠ upon this account it often fails of its Effects of a ~~Cathartic~~ laxative. When ever this is the case we may suppose that it has met with an ♃ in the Stomach, (which is of the acetous kind) & has been decomposed by it. –

2d – It action upon Earths – 3 Inflammables & 4 Metals are not remarkable – 5th It dissolves readily in water – hence it derives its name of ♃ Solubile –

6th Its action upon animal & Vegetable substances is very feeble –

## Origin. –

It is entirely artificial – you will see an account of the methods of making it by mixing ye simple ♃ of ♃ with a vegetable Alkali, in Boerhaaves & Macquairs Chemistry & in ye New Dispensatory – Besides this there are three other Methods of making it an account of which please to bring in at ye next Lecture. –

Borax

(a) Acts upon most of the Earthy Bodies, after it is ~~has~~ fused so as to assist in Vitrifying them. —

## Borax —

This salt is composed of sedative salt & a fossil alkali. Its Crystals are large, irregular & remarkably transparent. —

### Effects of Heat.

When it is first exposed to the fire it emits an aqueous Vapor, & afterwards melts into a kind of Glassy substance. Upon examining of it after this we dont find that it has undergone any decomposition. If this Glassy substance is dissolved in water it again crystalises into Borax —

### Effects of Mixture

1st Borax may be decomposed by the ⊕> ⊖> & ⊖>, we have an account of its being decomposed even by the Vegetable acids. The sedative salts, which is a weak acid sui Generis, rises ~~into~~ the Receiver, & the Neutral salt formed in the Retort, will be according to the nature of ye Acid we employ. It may be decomposed by the ⊖> in a State of Solution — The ⊖: in the mean time crystalizes —

a) 3dly It dissolves in V by means of heat. The V afterwards burns

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burns with a beautiful green Flame. —

4ly It acts upon all the Metals so as to promote their Fusion. It is much used upon this account by the Goldsmiths, & other workers in Metals in Soldering — an Operation this which consists in uniting pieces of the same, or different Metals together — It precipitates most of the Metals from their Solution in Acids —

5ly It dissolves with Difficulty in Water in so much that 30 times its Weight of Water are necessary for this Purpose —

6ly It acts subtly upon Animal & Vegetable Substances —

As to its Origine — It is brought to us from ye East Indies — It was a long time unknown whether it was formed ~~from~~ by Nature or Art. — The Borax brot from India has a dirty colour. The Method of purifying it was long a Secret among ye Venetians. — It is now understood & practized in Holland — a Place where it probably will continue for ever unless

accident

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accident should discover it. —

— after many fruitless Enquiries into the man-
ner in which this Salt is prepared, the French Acade-
micians (a set of men, whose zeal in investigating
Knowledge, cannot be too much commended) have at
last found out that it is artificial Substances. The
Method of making it is as follows, a quantity of fatty
Substances, are thrown upon a like quantity of pipe
Clay — & suffered to lie exposed to the Action of the Air for
a Year or two. The fatty Substances during this time ex-
volve an Acid, which corrodes & dissolves part of the ~~fatty~~
Clay so as in some measure to neutralize itself — It is no
new discovery that an acid is obtained from Marble. —
acid which is capable of corroding.
In what manner the fossil Alkali is formed we cannot
pretend to say — It is a doubt whether it preexisted in
the Clay or was formed by the Action of the Acid upon
it. — In what manner it is purified after this, we are

likewise

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likewise at a loss to say – If it is dissolved in pure water, & afterward crystalized, the Crystals are remarkably small. They are much larger & more like ye genuine Borax when dissolved, & afterwards crystalized. –

– As it is probable we shall now have a much larger Demand for this Article than formerly, upon the account of the New China Manufactory, which is now going on among us. I think a manufactory of it might be set on foot here with great advantage to Individuals, as well as to the whole Country – With this we finish our account of the Neutral Salts. –

– You will find subjoined to the Table of ye Neutral Salts, an account of the Synonima of all ye simple & compound Salts. – You would do well in committing them to memory. It will keep you from be imposed upon by the Authors you Read, & ~~keep you~~ from making mistakes in writing Prescriptions Yourselves.

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I shall now add a few Remarks upon the Pharmacy of ye Neutral Salts — —

— There is no Sett of Medicines, which have been more extensively in use than these Salts — Whole Volumes have been written in praise of Several of them — This prejudice in favour of these Medicines arose from two Causes. 1st an Ignorance of Chemistry & 2dly from an Ignorance of ye laws of the Animal Oeconomy & of the Causes of Diseases — The first led Physicians to imagine that each neutral Salt contained different Virtues, & in some Cases to act as if the same Salt had as many different Virtues as Names. The Second Cause has proved no less productive of error in the exhibition of these Salts. The human Body has been considered too much in the light of an elegant Chemical Vessel. Our Solids have been looked upon as possessed of no other properties than Black-lead, or the other Materials of furnaces, & the fluids have been thought to be the only Seat of Diseases, & the only parts of the Body on which Medicine could produce any Effects.

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Effects. Far be it from me to deny the application of Chemistry to Physic — On the contrary, I am fully perswaded that Physic can never arrive at Perfection, untill we are acquainted with all the Laws & principles of Chemistry — I speak only against those Chemists, who know nothing of the Nature or laws of the Animal Oeconomy, or against those Physicians who know nothing of Chemistry — Both of them are alike unfit to investigate the Causes, or to prescribe in ye Cure of Diseases. — There is one Thing I would beg leave to inculcate upon you, ~~that is~~ it is to consider the human body as an Animated Machine. Without having this principle impressed upon your Minds, you will be liable to imbrace all the Errors, which the Mechanical as well as ye Chemical Phylosophers have introduced into Physic. A single ~~exact~~ Example will ~~to~~ serve to illustrate what I mean by this caution. — If we see a Simple or Natural Salt added to any Substance, immediately render it more sensible or fluid than it was before, by applying

the

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this Analogy to the human body, we immediately con-
clude that the same Salt will produce the same effects
upon our fluids — Here we Reason as if the Body was
a lifeless piece of Matter, but when we call in the
action of the Nervous System, upon which this neutral
Salt must act before it arrives at the Blood, & when
we consider how much mixture alters the Nature of
Salts we are ~~little~~ led to conclude that the Analogy out
of the body does not in any Part apply within the
Body — Having promised these Observations, I shall
now enquire into the operation of those Salts we have been
treating of. — They have all been supported by ~~Dr. Beer~~:
Dr. Brocklesby. The chief Fact upon which he founds
it, is that the neutral Salts generate Cold during their
solution. The Regenerated ♃ generates a considerable
Degree of heat during its solution, & yet this Salt
exerts ye most cooling Effects of any of them —
I conclude therefore that all the neutral Salts like
the simple Salts, act as sedatives only, & that in a
much less degree than acid Salts — —

Their

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Their Action indeed is less confined to the Stomach than ye Simple Salts – many of them reach ye Intestines & prove gently Laxative when given in sufficient Doses – It is probable a small part of them enters the Lacteals in a most dilute State, & is afterwards concentrated in the Kidney, where they may prove diuretic – I am however far from thinking that Salt never proves diuretic till it has reached ye urinary Passages – I shall hint presently at another method in which I apprehend they may produce their Diuretic Effects –

– They open the Bowels without irritating the System – & upon this account they are particularly useful in Hæmorrhages – Fevers – Gonnorhœas & ye like. –

– In Cases of Obstinate Costiveness they are very powerful, in as much as they open the Bowels without encreasing the Spasm, which so often

occasions

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occasions Costiveness. —

— In Obstinate Rheumatisms, the Neutral Salts have been found very useful — Their Sedative Virtues is confined chiefly to the Arterial System — It is hard to tell here, whether their Good Effects depend upon their keeping the Bowels open, &c or upon their exerting a Sedative Power only. —

— In those Remitting or Intermitting Fevers, where we are afraid to give the Bark, upon the account of ij Spasms on the extremities, not being universally resolved — & where in Consequence of this there is a determination of Blood to the Viscera, the Addition of a Neutral Salt, such as Nitre — or vitriolated ♃ to ℥ Bark, not only prevents the Bark from doing any harm, but adds greatly to its febrifuge Virtues. —

— I shall now make a few remarks upon each of the Neutral Salts. —

— The Glauber Salt is one of the Safest & best purges

we

(a) This Medicine is the Panacea of the Famous Dr. Magraw of New York. I have seen several of his prescriptions, most of which contained this as an Ingredient. The Dr. uses it chiefly in slight fevers of the Inflammatory kind & seldom fails of success, as it is sedative, gently Diaphoretic, & Laxative. — & Diuretic — —

we are acquainted. It is an excellent Medicine when given in small Doses in the Billous Fever – Of late it has been much used in the Dysentery. – See Dr. Monroes account on the Diseases of the Army, who is very ~~full~~ large in praising this Salt joined with manna in this Disorder. It is an excellent Substitute for that most nauseous & disagreable Medicine Rhubarb – I have constantly used it in my practice & cannot say I ever have found it fail of Success. –

— The Epsom Salt (which is made of ⊕ & magnesia) is but little inferior to the Glauber Salt in its Medicinal Virtues. –

(a) – The Vitriolated ♃ is a gentle & safe Purge – It is this Neutral Salt which we should use chiefly in the Rheumatism –

– Nitre is a cooling useful Medicine, & is particularly useful in all Inflammatory Fevers – It is an excellent detergent in cleansing the mouth from Aptha when it is mixed with Vinegar – or what is better

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bitter, the Native acid, in the form of currant Jelly.
— It is apt to irritate the Lungs, & therefore it should always be given with Caution in Consumptive & Asthmatic Cases — Dr. Cullen used to tell us a story of a Man, who was immediately thrown into a most Violent fitt of Coughing upon taking the least particle of Nitre. — The Effect of it was the same even when it was thrown up (without his knowledge) by the Way of ~~Clyster~~ Glyster. — here Page 201 comes in & continues till 209.

The Nitrous Ammoniac has been but little used in Medicine — It may have for what we know considerable Medical Virtues —

Common Salt is but little used in Medicine. It is generally an ingredient in opening Glysters. I have known it used with considerable success in checking the Most obstinate Vomitings, in the Infirmeries at Edinburg. — A handful of it should be dissolved in a Quantity of Water or any of the Herb Teas. —

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Upon this account we find it is prescribed pretty universally in Inflammatory Disorders. As this Opinion is ~~often~~ of long Date, & pretty generally embraced — we shall spend some time in enquiring into the Truth of it, & here you may be assured I shall be influenced by the same Regard to simple Facts, which I have hitherto endeavoured to mantain in every thing I have proposed to you — Let us in the first place suppose the Blood to be primarily affected in Inflammatory Disorders. Let us with Dr. Huxham suppose this affection to consist in a lentor, or a preternatural Degree of Viscidity in the Blood, & then let us enquire how far this Doctrine accords with the Manner in which Inflammatory Disorders are brought on, & the manner in which they are cured. Have we not often seen persons in perfect health, suddenly seized with inflammatory fevers, from being exposed to a little Cold, or perhaps only from

wetting

witting this fact, & have we not seen this disorder removed by bleeding — a sweat, or perhaps a single Vomit? Hit possible to conceive that a morbid lentor of the Blood could have been brot on & cured thus suddenly? I need not dwell a moment to show the improbability of such changes taking place. Now if Vomits, sweats & Bleeding which operate on the whole system, have no effect in attenuating the Blood, what can be expected from a few Doses of Nitre, even supposing (what we cannot admit) that they enter the Blood. Can it be conceived that an ℥ or ℥ij at most of salt petre, should in a few hours dissolve 5 or 6 Pounds of Blood. Credat Judæus Apella. It requires no arguments to refute so absurd an Opinion. I conclude therefore that a morbid Lentor never takes place in the Blood, & if it did I boldly pronounce that Nitre could never act upon it as an attenuant. Some I know, make it a practice to combine Nitre with Alexipharmic Medicines, particu-

larly

-larly with Contrayerva. I shall say nothing of this practice here, only that I believe it cannot do any mischief. As I have nothing more at heart than the Improvement of my Pupils, I shall beg leave to ~~give~~ make a discussion here & give an Account of the Nature & Cause of Inflammation. —

I think my self Obliged to do this in order to compensate for the Theory which I rejected. It would be hard upon you to part with the knowledge you bring here with you, without carrying away any thing in the Room of it. —

— Inflammation then we believe is seated entirely in the <u>Solida Viva</u>. By Solida Viva I mean with ~~Dr Gaubius~~ Dr. Gaubius every part of the Body, which is capable of irritability. I use this Phrase on purpose to point out a Distinction between them & the <u>Solida Simplicia</u>, which includes those parts of the Body, which are not irritable, particularly the Bones & ye like.

The

The living Solids are always more or less in a State of tension. By tension I understand a proper degree of fullness, & Elasticity in the whole System, particularly in the Blood Vessels. This Tension will depend 1st upon the Quantity of Blood in the Vessels. –
2ly Upon Exercise, &
3ly upon the different degrees of heat & Cold in the Air –
If the Blood Vessels are too full of Blood, if the Blood has been impelled with too much force into the smaller Vessels by Exercise, or lastly if the moving fibres has been too much braced up by cold, the Vessels will be ~~contracted~~ overstretched, & an excess of tension will take place. This will therefore bring on what is called the <u>inflammatory Diathesis</u>. Corpulent, athletic people will be more subject to it than lean People – Young men more than old, especially about the Age of one & twenty; a time in which the impetus of the Blood continues the same, while the Solids

refuse

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refuse to give way to it. Men will be more subject to it than ~~[illegible]~~ Women — Persons who work hard, will be more subject to it, than those, who lead Idle sedentary Lives, & lastly they will all be more subject to it ~~than~~ in Winter than in Summer; you will easily ~~see~~ understand the Reason of these proportions & you ~~will~~ all know how much they are founded upon daily ~~practice~~ Observation. —

— Having now explained the Nature of Tension — when it is in Excess, let us next enquire what will be the Consequence of it. This may be illustrated by a familiar Example or two. If a heavy weight is suspended for sometime to the hand, every vessel in it is immediately filled with blood — Every muscular Fibre swells by a sudden Influx or Energy from the Sensorium — The Whole hand then is in a State of over-stretched Tension — But the moment you remove this Weight — what follows? The hand immediately begins to tremble — & is often seized with Spasmodic

affections

Affections, & so weak does it become, that it is with Difficulty we grasp, or lift a much lighter body afterwards. In like manner if we give Bitter & Astringent Medicines too long in a weakness of the Stomach we encrease its tension to such a degree as often to bring on Spasms, & the most excruciating pains. Persons who have been addicted to drink too ~~much~~ large quantities of Spirituous Liquors are melancholy instances of this. At first these liquors brace up the Stomach, but after a while they destroy its tone entirely, & thus render a Repetition of the same poison (which at first disordered their Stomachs) in some measure absolutely necessary. Nothing but Spirits will procure a temporary Relief — as they in some degree obviate the <u>attonia</u> or the Want of Tension. —

— Attonia is the Forerunner & foundation of all Spasm. — <u>Attonia gignit Spasmos</u> is a Sentence which occurs in almost every Page of <u>Hofmans</u> Works. —

But their is another Species of attonia quite the

reverse

reverse of that we have been treating off. This is occa:
:sioned 1st by a Want of fullness in the Blood Vessels —
2ly by a want of exercise, & lastly by a warm moist weather.
This species of attonia brings on a Predisposition to Disorders
the nature of Inflammatory; Such particularly as the Ner:
:vous & Malignant Fevers. All weaking Passions of the
mind such as Grief, Fear & love, tend to encrease this last
species of attonia. & hence we find Persons who labour under
any of those Passions, are most liable to be affected with ye
Nervous & malignant Fevers. But to return.

Inflammatory fevers are then occasioned by a
Spasm upon the Capillary Vessels, of which terminate
in all parts of the Body. The Cure of these Disorders is
a further Proof of the Truth of what we have advanced —
Blood letting — warm Bathing of ye Extremeties — dilu:
:ting Drinks — opening Glysters & the like, all tend to
lessen the Excess of Tension we spoke off. & thus suffer the
Vessels again to recover their usual Elasticity & strength.

From

From what has been said, you will now understand the Reason of the Phenomina, which the Blood exhibits to us upon Bleeding without calling in lentor or Viscidity on the one hand or putrid dissolution on ye other. The Circumstances of drawing the Blood alter its appearance greatly, as we shall show when we come to speake of its chemical History. but Independent of this we may say that strong rigid solids generally give us what is called dense rich inflamatory Blood, & e contra a weak state of the living solids for the most part give us a thin dissolved Blood. But we shall say more of this hereafter. This Gent: is a short account of the proximate Cause of Fevers. I flatter myself that you are so well convinced of the Reasonableness of it that I need not take up your time in mentioning the Objections against the Doctrine of Morbific matter & Concoction. It would give me great Pleasure to explain here all the Phenomina of fevers in order

that

208. that we might shew how exactly they correspond with the Doctrine we have advanced. But this belongs to another Professor. I might likewise shew you in what Manner all the Medicines that are given in Fevers produce their effects. But this many of you have already heard discussed in a more masterly manner than I am able to do, by our Ingenious Professor of Materia Medica.

Dr. Cullen was very fond of prescribing it in small Doses in the Scrophulæ as an universal Stimulus —

Digestive Salt. — has no Virtues in Digestion, or in any thing else that we know off. —

A French Physician One wrote a Book upon the Virtues of this Salt in curing Intermittents. Some Years afterwards, when he was appealed to by the public, for some proof of its success in this Disorder, he tried it frequently but to no purpose & was obliged to acknowledge that "he did not know what was the Reason of it, but Sylvius's Salt did not serve him as faithfully as it was used to do." I believe many would make the same Complaint of a want of faithfulness in our Medicines if we were pushed as closely as the Frenchman, by our Brotheren. —

Vitriolic Ammoniac is ~~Acid~~ seldom used in Medicine — The Common Ammoniac possesses all its Virtues —

Dr.

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Dr. Cullen used to recommend it in order to render the paroxisms of Intermittents regular, & thus to prepare the Way for giving the Bark. He used to ~~recommend it in order to render~~ tell us however, that he never heard an Instance of its performing a compleat Cure of an Intermittent. —

— Regenerated ♃ is a pleasant agreable salt. — Its Virtues as a diuretic are the same as the other neutral salts. It is disputed whether it acts by determining an unequal Quantity of the Fluids to the urinary passages, or whether it acts directly upon them. We have several Analogies of substances which produce effects upon very distant parts of the Body by operating only on ye Stomach — Thus Opium we find often produces an Itching in the Skin sometime after it is taken. — Several kinds of Fish produce an Eruption on the face almost as soon as they are taken into the Stomach —

Wine

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Wine produces a flushing in the Cheeks almost as soon as it is swallowed — many examples of a like Nature might be mentioned, but these are sufficient to shew us that Diuretics may produce a Determination to the Kidneys without ever mixing with the Blood, or even that part of it which is most disposed to pass off by the urinary Passages —

— The soluble Tartar is chiefly used as an opening Medicine in Obstructions of the Bowels. But as it sometimes meets with an acid in the Stomach, as we said before (which is of the acetous kind) it is apt to be decomposed, & instead of a soluble ♃ a Regenerated ♃ is formed in the Stomach. This I believe always happens in those Cases, where it does not operate quickly — As it is liable to this Decomposition — The Glauber Salt I should think would be a much better Medicine in all those Cases, in which soluble ♃ is given —

— You are all well acquainted with the Virtues of

Spirits

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Spiritus Mindererii. — It is an agreable Medicine, & when given in very large doses proves gently Diaphoretic & diuretic —

To this we may add another neutral Salt Mixture made from the native instead of the fermentes Acid. It is called the Saline mixture. When it is giving during the act of Effervescence, it is called Riverius mixture. Its Virtues are the same as Spt. Mindererii. It has the advantage of being more pleasant. —

The Sal Saignet or Rupellens is now entirely laid aside. Borax is used only in Aphtha. This Gent. finishes our account of ye Neutral Salts. I thought it necessary to deliver these Observations upon their pharmaceutical History while the Composition & Properties of them are fresh in your ~~Minds~~ Memories. At our next lecture we shall begin to treat of the Earthy Substances.

End of the 2d Volumn. —

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pond with the Doctrine we have advanced. But this
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